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INTRODUCTION

These inventory procedures represent a cost effective inventory of the wildlife populations on the Merritt Island, Pelican Island, and St. Johns National Wildlife Refuges. The species selected for inventory were based on guidance provided in the Refuge Manual and the Regional Office memo of April 10, 1985, "Wildlife Inventory Plans". Most inventory procedures are integrated with other refuge wildlife management activities and studies to provide either an objective evaluation of that activity or additional management information concerning that activity.

ANNUAL SCHEDULE

The annual schedule estimate is provided for personnel scheduling purposes and is provided in terms of staff-days. This includes only refuge staff and does not include volunteer-hours.

	Month												
Procedure	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL
Winter Waterfowl	2.2	3.2							2.2	2.2	2.2	2.2	14.2
Mottled Duck		0.5	6.0										6.5
Colonial Birds		0.5	0.5	0.5	2.0	3.0							6.5
Shore-Marsh-Wading	1.5	1.5	1.5	1.5	1.0	0.5	2.0	0.5	2.0	1.5	1.5	2.5	17.5
Scrub Jay						2.5	2.5	2.5	2.0				9.5
Bald Eagle		0.5			1.0			1.0					2.5
Osprey					2.0								2.0
Raptor								2.0				1.0	3.0
Breeding Birds			2.0				2.0						4.0
Marine Turtle					5.5	7.0	7.0	7.0	6.5				33.0
Alligator								5.0					5.0
TOTAL	3.7	6.2	10.0	2.0	11.5	13.0	13.5	18.0	12.7	3.7	3.7	5.7	103.7

ANNUAL COST

The annual cost estimate is provided for planning purposes and is estimated in 1985 dollars.

Procedure	Personnel	Transportation	Equipment	TOTAL
Winter Waterfowl	1300	1800	100	3200
Mottled Duck	700	2880	100	3680
Colonial Birds	700	600	50	1350
Shore-Marsh-Wading	1700	1360	50	3110
Scrub Jay	1000	100	110	1210
Bald Eagle	275	300	120	695
Osprey	200	300	50	550
Raptor	300	200	100	600
Breeding Birds	540	300	225	890
Marine Turtle	3250	1500	200	4950
Alligator	500	100	75	675
TOTAL	10465	9440	1180	20910

Refuge: Merritt Island National Wildlife Refuge (MINWR)

Procedure: IP 304

Species: Waterfowl (Anseriformes) and American Coot (Fulica americana)

Title: Winter Waterfowl Census

I. PURPOSE

Migratory waterfowl are one of the major groups of birds for which the Fish and Wildlife Service is responsible. The refuge conducts a waterfowl hunt on MINWR each winter and population data is important in managing the hunt as well as informing the hunters. This inventory is designed to estimate the number of wintering waterfowl on the refuge, compare these data to that collected in previous years, and provide accurate numbers for RMIS reports.

II. PROCEDURE AND DATA ANALYSIS

A. Procedure

In order to examine population trends during the year and from year to year, a standardized aerial census will be conducted during the first and third week of each month from September through February. All of the Indian River north of the Railroad Bridge will be included in the survey. The Atlantic Ocean will not be included. (Maps of the areas to be aerial census are attached.) The aerial census will begin no earlier than 0900 and will conclude before 1500. The census route is approximately 140 miles long over the MINWR. The aerial census should be conducted on clear or slightly overcast days; rain and high winds are to be avoided.

Two refuge persons familiar with the identification of waterfowl, capable of accurately estimating populations from the air, and knowledgeable of refuge geography are required. The census will be conducted from an OAS certified or approved 4 seat fixed or rotor winged aircraft with an OAS certified or approved pilot. All data will be recorded on a tape recorder and later transcribed. Data will be recorded by Management Units and 23 selected impoundments will be surveyed individually and recorded individually. These subdivisions in the population data are:

Indian River
Management Unit 1 (Shiloh) - Shiloh 1 and 5
Management Unit 1 (Beach) - V-3, T-43
Management Unit 2 - T-10-C, D, G, J, L
Management Unit 3 - T-27-A and B, T-38, T-40
Management Unit 4 - T-24-B and D
Management Unit 5 - C-21:36, T-33-B, T-29-B
Management Unit 6 - C-20-C, Moore Creek, C-15-C
Management Unit 7 - T-25-A, C-28-B
Management Unit 8
Management Unit 9

The 23 impoundments are the identical impoundments sampled for aquatic vegetation production by Wildlife Management Study (41570-02) "Aquatic Impoundment Habitat Monitoring on the Merritt Island National Wildlife Refuge".

The number of each species observed on the aerial flights will be recorded on Waterfowl Census Summary Sheets (attached) All numbers will be rounded up to the nearest ten.

B. Data Analysis

The data will be used for RMIS output reports and included in the Annual Narrative. Management unit data will be used to determine shifts in waterfowl utilization throughout the winter season. Impoundment data will be used in conjunction with Wildlife Management Study 41570-02 "Aquatic Impoundment Habitat Monitoring on the Merritt Island National Wildlife Refuge.

C. Data Filing

Summary sheets will be filed in the refuge files under WILDLIFE: Winter Waterfowl Census.

III. SPECIAL CONSIDERATIONS

Flight altitudes and speeds of between 70 to 150 feet and 65 to 85 knots respectively will be needed to conduct the census.

VI. MANPOWER AND COST

Personnel (113.6 staff-hours)	1400.00
Equipment (Aircraft rental)	1800.00
Other supplies	100.00
TOTAL	3200.00

Prepared By: Bill Leenhouts Date: 03-26-84

Reviewed By: Stephen R. Vehrs Date: 8/14/85

Refuge Approval: _____ Date: _____

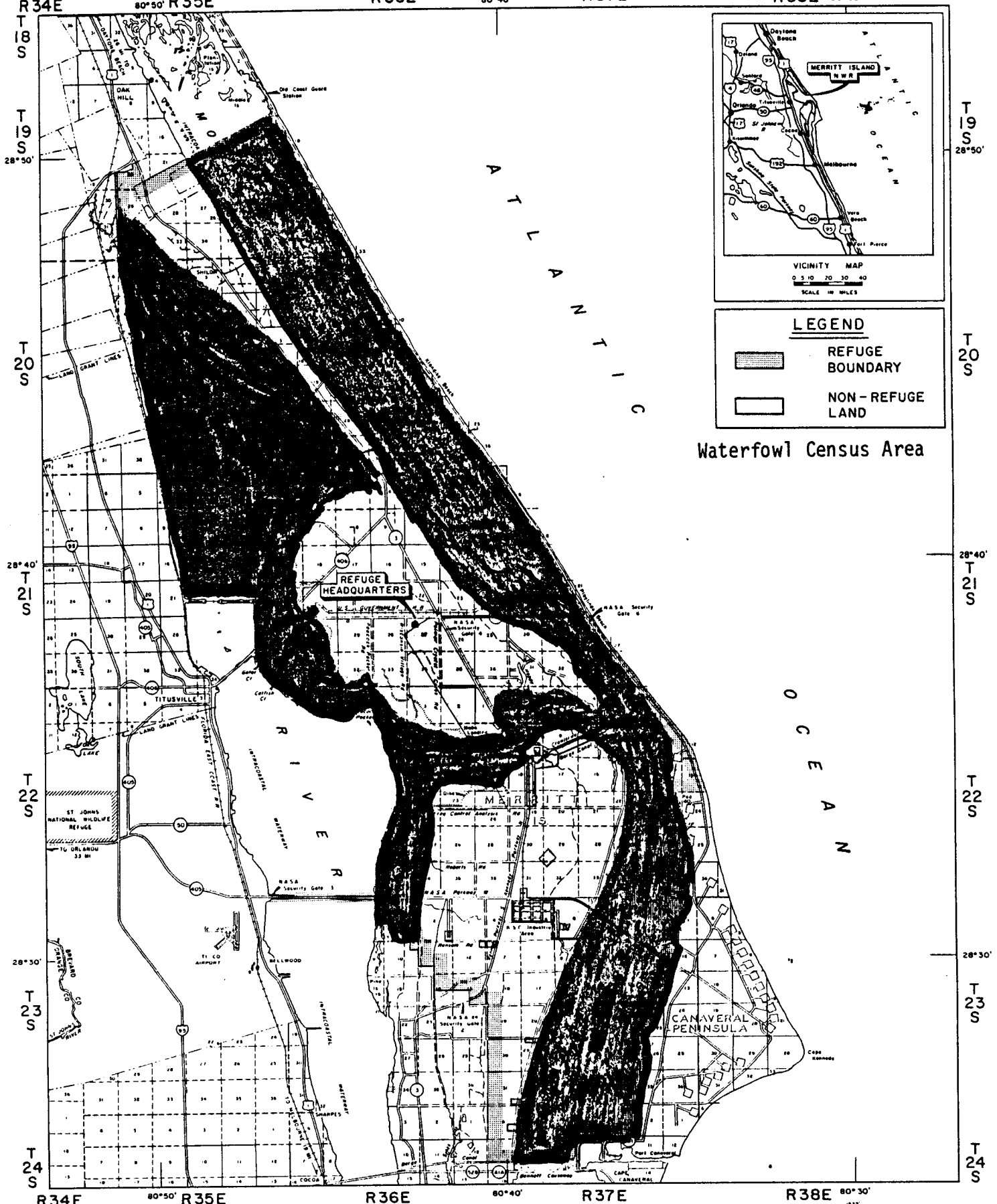
Regional Approval: _____ Date: _____

MERRITT ISLAND NATIONAL WILDLIFE REFUGE

BREVARD AND VOLUSIA COUNTIES, FLORIDA

UNITED STATES
DEPARTMENT OF THE INTERIOR

UNITED STATES
FISH AND WILDLIFE SERVICE



COMPILED IN THE DIVISION OF REALTY
FROM SURVEYS BY U.S.G.S.

ATLANTA, GEORGIA

REVISED · 10/79
JANUARY, 1973

TALLAHASSEE MERIDIAN

Scale 0 5000 10000 20000 30000 40000 FEET
0 1/2 1 2 4 6 8 MILES

MEAN DECLINATION 1973

4R FLA 632 413

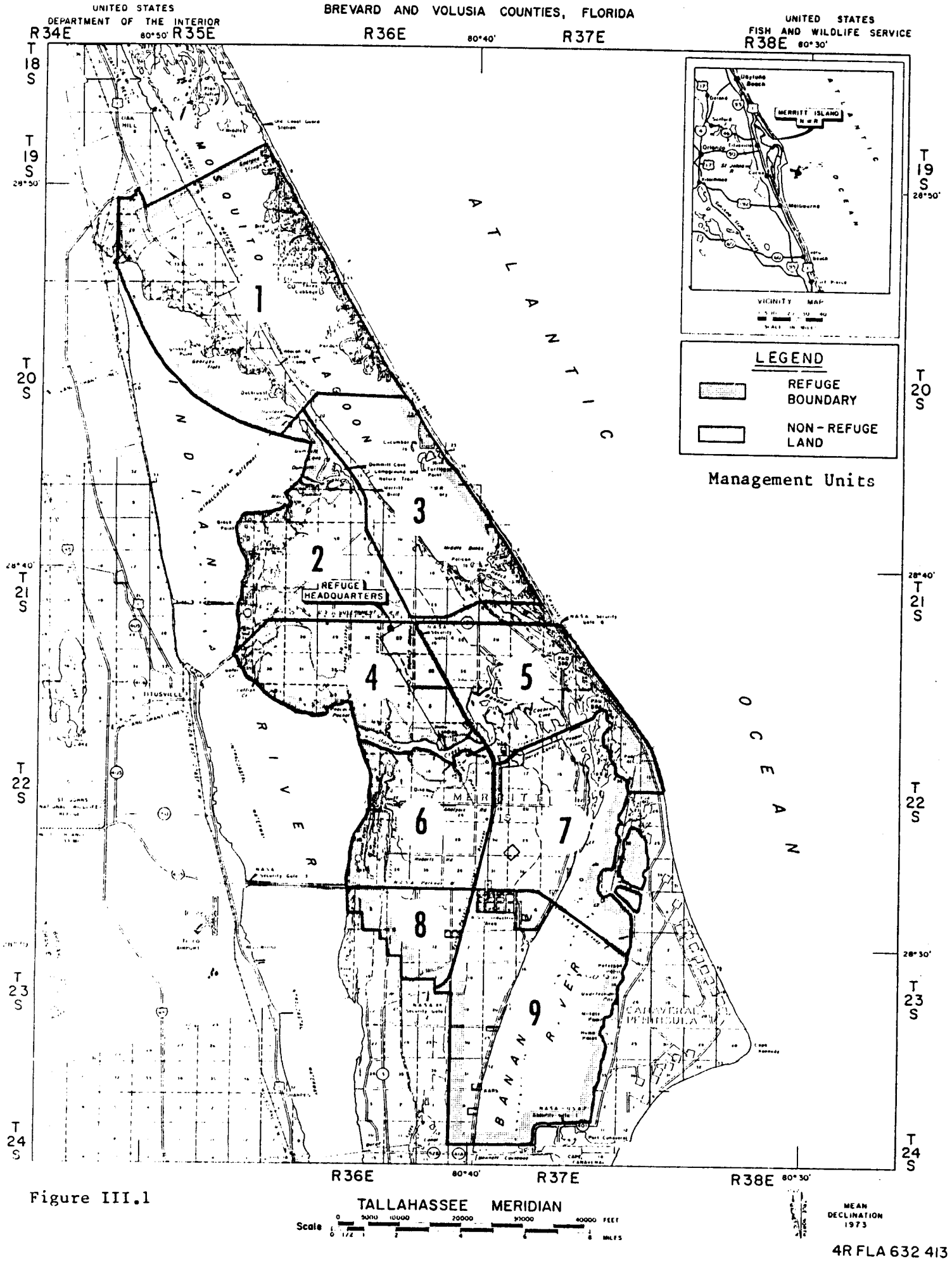

MERRITT ISLAND NATIONAL WILDLIFE REFUGE
BREVARD AND VOLUSIA COUNTIES, FLORIDA
UNITED STATES
DEPARTMENT OF THE INTERIOR
UNITED STATES
FISH AND WILDLIFE SERVICE
R34E
R35E
R36E
R37E
R38E
80°50'
80°40'
80°30'
T 18 S
T 19 S
T 20 S
T 21 S
T 22 S
T 23 S
T 24 S
28°50'
28°40'
28°30'
MERRITT ISLAND N.W.R.
VICINITY MAP
LEGEND
REFUGE BOUNDARY
NON-REFUGE LAND
Management Units
1
2
3
4
5
6
7
8
9
REFUGE HEADQUARTERS
NORTH INDIAN RIVER
MOSQUITO LAGOON
ATLANTIC OCEAN
BANANA RIVER
TITUSVILLE
CANAVERAL PENNINSULA
TALLAHASSEE MERIDIAN
Scale
MEAN DECLINATION 1973

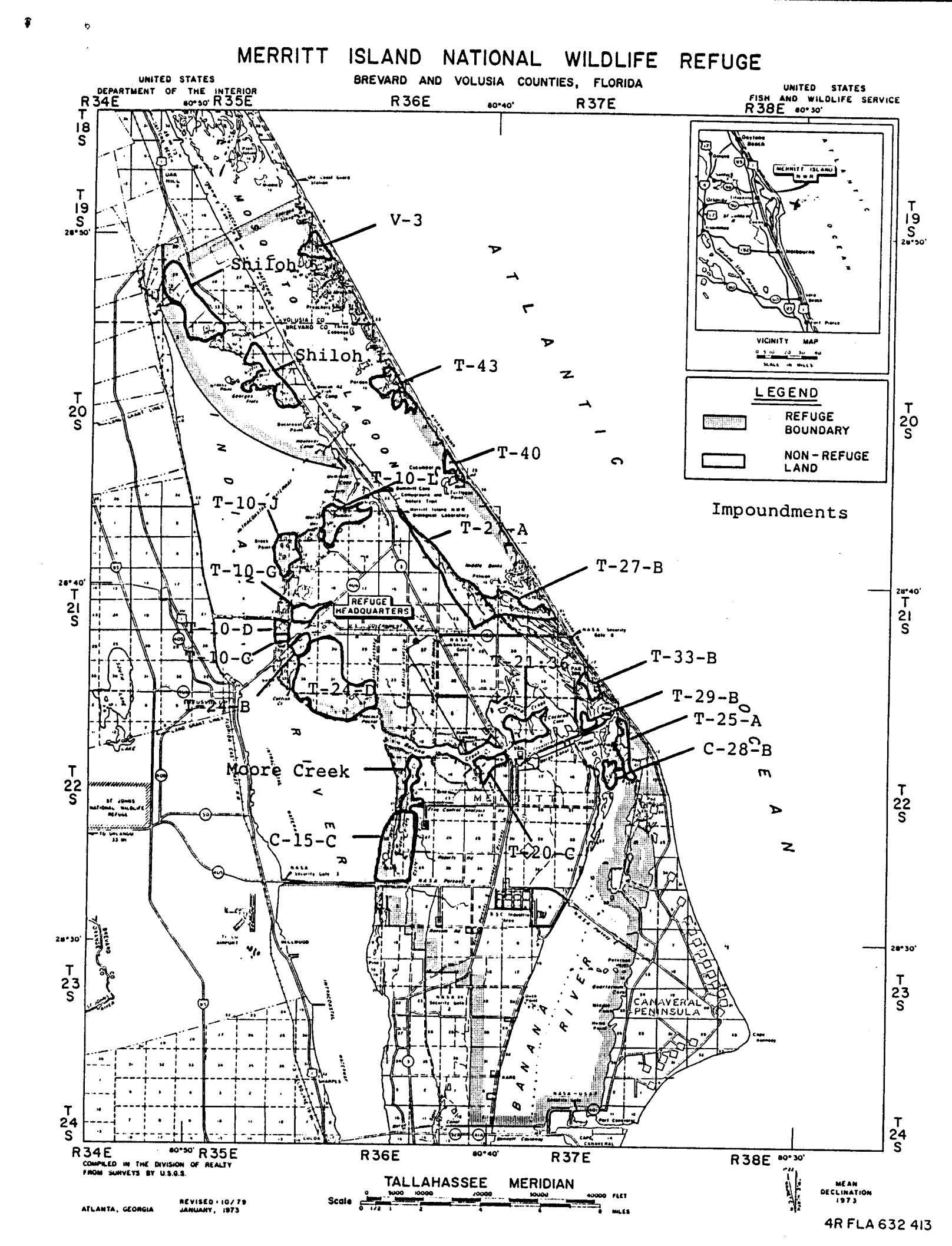
Figure III.1

MERRITT ISLAND NATIONAL WILDLIFE REFUGE

BREVARD AND VOLUSIA COUNTIES, FLORIDA

UNITED STATES
DEPARTMENT OF THE INTERIOR

UNITED STATES
FISH AND WILDLIFE SERVICE



COMPILED IN THE DIVISION OF REALTY
FROM SURVEYS BY U.S.G.S.

ATLANTA, GEORGIA

REVISED · 10/79
JANUARY, 1973

TALLAHASSEE MERIDIAN

Scale 0 5000 10000 20000 30000 40000 FEET
0 1/2 1 2 4 6 8 MILES

MEAN DECLINATION 1973

4R FLA 632 413

WATERFOWL CENSUS DATA

Date: _____

DATE	September		October		November		December		January		February	
Brant												
Snow Goose												
Blue Goose												
TOTAL GEESE												
F. Whis Duck												
Mallard												
Black Duck												
Mottled Duck												
Gadwall												
Pintail												
G W Teal												
B W Teal												
A. Widgeon												
Shoveler												
Wood Duck												
Redhead												
Ring-neck												
Canvasback												
Scaup												
Bufflehead												
Ruddy Duck												
Unknown Duck												
TOTAL DUCKS												
H. Merganser												
C. Merganser												
R. B. Mergan.												
TOT MERGANSER												
Coot												
Unknown Species												
TOTAL WATERFOWL												

WATERFOWL CENSUS DATA

Date: _____

MANAGEMENT UNIT	Shiloh	Beach	MU2	MU3	MU4	MU5	MU6	MU7	MU8	MU9		TOTAL
Brant												
Snow Goose												
Blue Goose												
TOTAL GEESE												
F. Whis Duck												
Mallard												
Black Duck												
Mottled Duck												
Gadwall												
Pintail												
G W Teal												
B W Teal												
A. Widgeon												
Shoveler												
Wood Duck												
Redhead												
Ring-neck												
Canvasback												
Scaup												
Bufflehead												
Ruddy Duck												
Unknown Duck												
TOTAL DUCKS												
H. Merganser												
C. Merganser												
R. B. Mergan.												
TOT MERGANSER												
Coot												
Unknown Species												
TOTAL WATERFOWL												

WATERFOWL CENSUS DATA

Date: _____

IMPOUNDMENT	S-5	S-1	V-1	T-43	T10C	T10D	T10G	T10J	T10L	T27A	T27B	T38
Brant												
Snow Goose												
Blue Goose												
TOTAL GEESE												
F. Whis Duck												
Mallard												
Black Duck												
Mottled Duck												
Gadwall												
Pintail												
G W Teal												
B W Teal												
A. Widgeon												
Shoveler												
Wood Duck												
Redhead												
Ring-neck												
Canvasback												
Scaup												
Bufflehead												
Ruddy Duck												
Unknown Duck												
TOTAL DUCKS												
H. Merganser												
C. Merganser												
R. B. Mergan.												
TOT MERGANSER												
Coot												
Unknown Species												
TOTAL WATERFOWL												

WATERFOWL CENSUS DATA

Date: _____

IMPOUNDMENT	T40	T24B	T24D	C21&36	T33B	T29B	T20C	Moore Creek	C15C	T25A	C28B	
Brant												
Snow Goose												
Blue Goose												
TOTAL GEESE												
F. Whis Duck												
Mallard												
Black Duck												
Mottled Duck												
Gadwall												
Pintail												
G W Teal												
B W Teal												
A. Widgeon												
Shoveler												
Wood Duck												
Redhead												
Ring-neck												
Canvasback												
Scaup												
Bufflehead												
Ruddy Duck												
Unknown Duck												
TOTAL DUCKS												
H. Merganser												
C. Merganser												
R. B. Mergan.												
TOT MERGANSER												
Coot												
Unknown Species												
TOTAL WATERFOWL												

Refuge: Merritt Island National Wildlife Refuge (MINWR) and St. Johns National Wildlife Refuge (SJNWR)

Procedure: IP 803 1340 LD

Species: Florida Mottled Duck (Anas fulvigula fulvigula)

Title: Florida Mottled Duck Breeding Population and Production Survey

I. PURPOSE

The purpose of this survey is to determine the numbers of Florida mottled ducks on the MINWR and SJNWR, their distribution over the available habitat, and the dynamics of the population over time.

Analysis of band recovery and harvest survey data by the Game and Fresh Water Fish Commission (GFC) indicates that the Florida mottled duck population is declining. However, because predictions of population trends based on mortality and natality estimates usually represents a simplified mathematical approach to complex biological processes, it is important to corroborate these inferences with direct indices to population status.

At present no effective direct population survey is being conducted. Less than 1% of the estimated 69,000 and 5% of the estimated 600 Florida mottled ducks within the state and the MINWR respectively are recorded during the annual mid-winter inventory and refuge waterfowl surveys. These poor results are probably the result of several factors: the seasonally-inundated habitat is not adequately represented in the surveys; the policy of rounding counts to the nearest 100 for reporting purposes is observed; fixed-winged aircraft survey methods are used; and the large number of other waterfowl species present during the winter surveys prevents an accurate Florida mottled duck count.

The FWS Regional Resource Plan recognizes that an improved population estimate is required in order to make proper inferences as to populations and population dynamics both on refuges and throughout the state.

Waterfowl production objectives for MINWR are 2500 ducks of which the Florida mottled duck makes up a significant proportion. In order to manage for the above objectives an improved Florida mottled duck population estimate is essential.

II. PROCEDURE and DATA ANALYSIS

A. Procedure

Florida mottled ducks on the MINWR and SJNWR will be surveyed annually via helicopter beginning the third Monday in March for 5 years beginning in FY 84. All Florida mottled duck habitat on both refuges will be surveyed. (Habitat to be surveyed is indicated on refuge maps in the Appendix.) One observer skilled in the identification of Florida mottled ducks will accompany an Office of Aircraft

Services (OAS) certified or approved pilot in an OAS certified or approved helicopter. The survey will take approximately 3 days to complete and should not begin before 0900 and conclude by 1500 each survey day. Surveys should not be conducted if wind speed exceeds 20 mph or if adverse weather conditions such as rain or fog exist. Altitude above the ground level should average 50 ft. and flight speed will vary depending on the type of habitat being surveyed.

The observer will record Florida mottled ducks seen from his/her side of the helicopter on a portable cassette tape recorder. Sightings will be recorded as seen and assigned to sub-strata (location - refuge, impoundment, area etc.) and classified as lone birds, pairs, pair and drake, or groups (>2), and by sex if possible. Ducks in flight over the area being surveyed will be recorded if they were suspected of flushing before the aircraft. Summary data forms will be completed from the recorded data following the survey (sample in Appendix).

Annual population dynamics and trends can be obtained only if the survey is conducted identically each year.

B. Data Analysis

The population survey is a total Florida mottled duck count of both refuges. Population data will be used in Refuge Output Reports for determining breeding populations and potential waterfowl production. Population data concerning individual impoundments will be used to locate concentrations of breeding pairs for banding, determine potential breeding habitat, and assess management objectives established in the Annual Water Management Program of the MINWR Marsh and Water Management Plan.

The survey is a complete population survey of the refuges. The number of breeding pairs is determined by adding the number of pairs, three bird groups and single birds. Mottled duck production is the number of breeding pairs X 4.9 (LaHart, D. E. and G. W. Cornwell. 1971. Habitat preference and survival of Florida duck broods. proc. Annu. Conf. Southeast. Game Fish Comm. 24:117-121.).

Annual population changes will be tracked for the 5 year duration of the inventory. Population changes will be correlated with habitat changes as determined by MINWR Management Study Proposals 41570-01 and 41570-02.

All population data and data analysis will be shared with the GFC in order to analyze the Florida mottled duck population and management potential across the state.

C. Data Filing

Data obtained will be computerized into existing data bases where appropriate and correlated with refuge management activities. Hard copies will be filed in the refuge files under WILDLIFE: Florida Mottled Duck Survey.

III. SPECIAL CONSIDERATIONS

Although fixed-winged aircraft have been the mainstay of waterfowl inventories, Bateman (Proc. Southeast. Assoc. Game and Fish Comm. 24:90-103, 1970) demonstrated in Louisiana that more mottled ducks could be observed from a helicopter than a fixed-winged aircraft ($P < 0.05$). This phenomenon was attributed to the greater visibility, slower air speed, and noise level of the helicopter.

The FWS Office of Migratory Bird Management recently evaluated helicopters for censusing waterfowl breeding populations by the transect method (M. Smith pers. commun.). For most species helicopter counts exceeded ground counts and demonstrated that "helicopter surveys are a legitimate substitute for ground surveys in establishing aerial visibility rates for breeding populations of the major waterfowl species in prairie and parkland habitat". This should eliminate the need for extensive ground truthing. Low Florida mottled duck densities, inaccessible habitat, and inadequate manpower hamper estimation of ground:air count ratios with an acceptable level of precision.

This refuge survey is patterned identical to that of the GFC [illegible] mottled duck survey so that data obtained can be exchanged without loss of accuracy or precision.

IV. MANPOWER AND COST

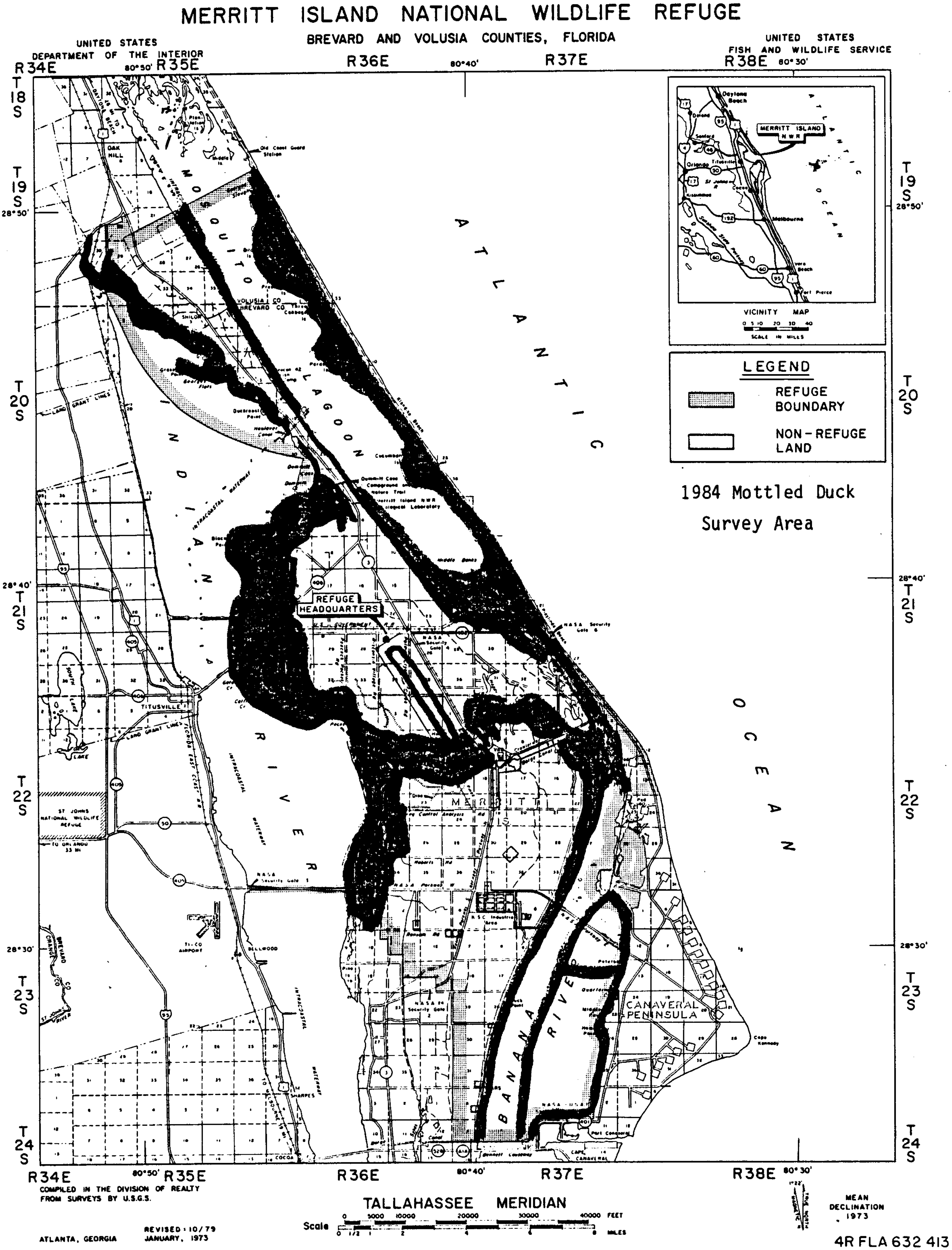
Personnel	
Field Survey and Analysis (52 staff-hours)	$ 700.00
Transportation	
Helicopter and pilot (18 hrs.)	2880.00
Other Expenses	
Office supplies, batteries, etc.	100.00
TOTAL	$3680.00

Prepared By: Bill Leenhouts Date: 11-14-83

Reviewed By: _____ Date: _____

Refuge Approval: _____ Date: _____

Regional Approval: _____ Date _____


MERRITT ISLAND NATIONAL WILDLIFE REFUGE
BREVARD AND VOLUSIA COUNTIES, FLORIDA
UNITED STATES DEPARTMENT OF THE INTERIOR
UNITED STATES FISH AND WILDLIFE SERVICE
R34E
R35E
R36E
R37E
R38E
T 18 S
T 19 S
T 20 S
T 21 S
T 22 S
T 23 S
T 24 S
MOSQUITO LAGOON
INDIAN RIVER
BANANA RIVER
ATLANTIC
OCEAN
MERRITT
TITUSVILLE
CANAVERAL PENINSULA
REFUGE HEADQUARTERS
VICINITY MAP
LEGEND
REFUGE BOUNDARY
NON-REFUGE LAND
1984 Mottled Duck Survey Area
COMPILED IN THE DIVISION OF REALTY FROM SURVEYS BY U.S.G.S.
TALLAHASSEE MERIDIAN
Scale
MEAN DECLINATION 1973
ATLANTA, GEORGIA
REVISED: 10/79 JANUARY, 1973
4R FLA 632 413

Florida Mottled Duck Survey

Refuge Merritt Island Nat. Wildlife Refuge Dates _____

Description of Conditions During Survey _____

Management Unit 1

Shiloh 5 _____
Shiloh 3 _____
Shiloh 1 _____
T-21 _____
V-1 _____
V-2 _____
T-44 _____
T-43 _____
T-42 _____
Indian Rv. _____
Mosq. Lag. _____

Management Unit 2

T-9 _____
T-10-M _____
T-10-L _____
T-10-K _____
T-10-J _____
T-10-I _____
T-10-H _____
T-10-G _____
T-10-F _____
T-10-F _____
T-10-E _____
T-10-D _____
T-10-C _____
T-10-B _____
T-10-A _____
Gator Ck. _____
Indian Rv. _____

Florida Mottled Duck Survey

Management Unit 3

T-41 _____
T-40 _____
T-39 _____
T-39-So. _____
T-38 _____
T-27-A _____
T-27-B _____
T-27-C _____
Mosq. Lag. _____

Management Unit 4

Gator Ck. _____
T-24-A _____
T-24-B _____
T-24-C _____
T-24-D _____
T-16 _____
T-17 _____
T-18-A _____
T-18-B _____
Indian Rv. _____
Banana Ck. _____

Management Unit 5

T-27-D _____
T-34 _____
T-35 _____
T-37-A _____
T-37-B _____
C-21 & 36 _____
T-33-A _____
T-33-B _____
T-33-C _____
T-29-A _____
T-29-B _____
T-25-A _____
T-25-B _____
Banana Ck. _____

Florida Mottled Duck Survey

Management Unit 6

C-20-C _____
C-20-B _____
C-20-A _____
Moore Ck. _____
C-15-D _____
C-15-C _____
C-15-E _____
Indian Rv. _____

Management Unit 7

C-28-A _____
C-28-B _____
T-30 _____
C-21-B _____
Banana Rv. _____

Management Unit 8

C-15-CB _____
Indian Rv. _____

Management Unit 9

Banana Rv. _____

TOTAL for MINWR _____

Refuge St. Johns Nat. Wildlife Refuge Dates _____

St. Johns Unit _____

Bee Line Unit _____

TOTAL for SJNWR _____

Refuge: Merritt Island and Pelican Island National Wildlife Refuge (MINWR), (PINWR)

Procedure: IP 311-312

Species: Colonial Breeding Birds

Title: Colonial Breeding Bird Survey

I. PURPOSE

Colonial breeding birds represent a significant portion of the wildlife production on the refuge. There are several colonial breeding bird colonies on the refuge and several colonial breeding bird species are of special concern to the Fish and Wildlife Service and the National Wildlife Refuge System: endangered species - wood stork, category 2 species - reddish egret and roseate tern, Regional Resource Plan (RRP) species - least tern (coastal population). The RRP advocates that accurate breeding population and total population numbers be obtained for wood storks, eastern brown pelicans, and least terns (coastal).

This survey is designed to census the breeding bird populations of all species found at the colonial nesting sites on the refuges, detect population changes over time, and make management recommendations. This includes the species of special concern as well as other species at the colony.

II. PROCEDURE AND DATA ANALYSIS

A. Procedure

Ground and aerial surveys will be used to locate and estimate colonial breeding bird populations each year. (See map for locations of established colony sites.) The populations of large birds can adequately be estimated by low level aerial censuses over the colony but smaller birds will require a ground census. Ground censuses will not be needed for those colonies containing only large birds (i.e. Bird Island, Mullethead Island, Moore Creek, Picnic Island, Jack Davis, T-30, Barge Canal). New colonies will be added and colony sites no longer active will be dropped from the survey when needed. Any nesting taking place on the MINWR Atlantic Ocean beach will be documented in the Beach Survey portion of the Shore, Marsh, and Wading Bird Survey inventory procedure.

Monthly aerial surveys will be conducted on the second Monday of each month starting in February and continue through June as breeding cycles vary from year to year and between species. Aerial census flights can be combined with other refuge project flights. The ground surveys should be conducted during the last week of incubation or the first weeks of brooding for the species associated with each colony. Aerial surveys will be used to establish the time for ground surveys. Two ground surveys per colony will be needed (third week of May and third week of June).

The aerial census technique consists of flying an OAS certified or approved fixed or rotor winger craft over each colony and having a qualified observer estimate the breeding bird populations by species. Aerial photographs of the

colony should also be taken to validate the estimates. The ground census technique involves boating to the colony and having a qualified observer examine the colony from the edge estimating the breeding bird populations by species.

Mornings or cool days are best for ground censuses and mid-morning for aerial censuses. Rainy, hot, or windy days should be avoided. Equipment needed for ground censuses includes a boat, motor, boat safety equipment, binoculars, and/or spotting scope, tape recorder or data forms, and pencils. Equipment needed for aerial censuses include a OAS certified aircraft and pilot, proper flight safety equipment, camera, film, tape recorder or data sheets, and pencils.

B. Data Analysis

Aerial photographs will be inspected and analyzed to validate observer estimates made during flights.

The estimated number of birds and active nests in each colony and nesting stage will be recorded on Colonial Bird Register forms (attached). CBR forms will be submitted to CBR, Cornell University, 159 Sapsucker Woods Road, Ithaca, New York, 14850.

C. Data Filing

Field survey sheets, summary sheets and Colonial Bird Register forms will be filed in the refuge files under WILDLIFE: Colonial Breeding Bird Survey.

III. SPECIAL CONSIDERATIONS

Aerial censuses should be conducted as secondary projects of other refuge aerial projects (i.e. waterfowl surveys, Florida mottled duck census, fire detection, etc.) whenever possible. Accurate scheduling of ground censuses is important to avoid repeat visits to the same colony site. This is a cooperative inventory which will provide data not only needed for refuge management but also for total population management.

VI. MANPOWER AND COST

Cost estimates reflect an independent survey conducted with a fixed winged aircraft.

Personnel (52 staff-hours)	$ 700.00
Equipment	
Aerial Censuses (10 flight hours)	500.00
Ground Censuses	100.00
Other expenses	
Office Supplies, batteries, film, etc.	50.00
TOTAL	$ 1350.00

Prepared By: Bill Leenhouts Date: 03-26-84

Reviewed By: _____ Date: _____

Refuge Approval: _____ Date: _____

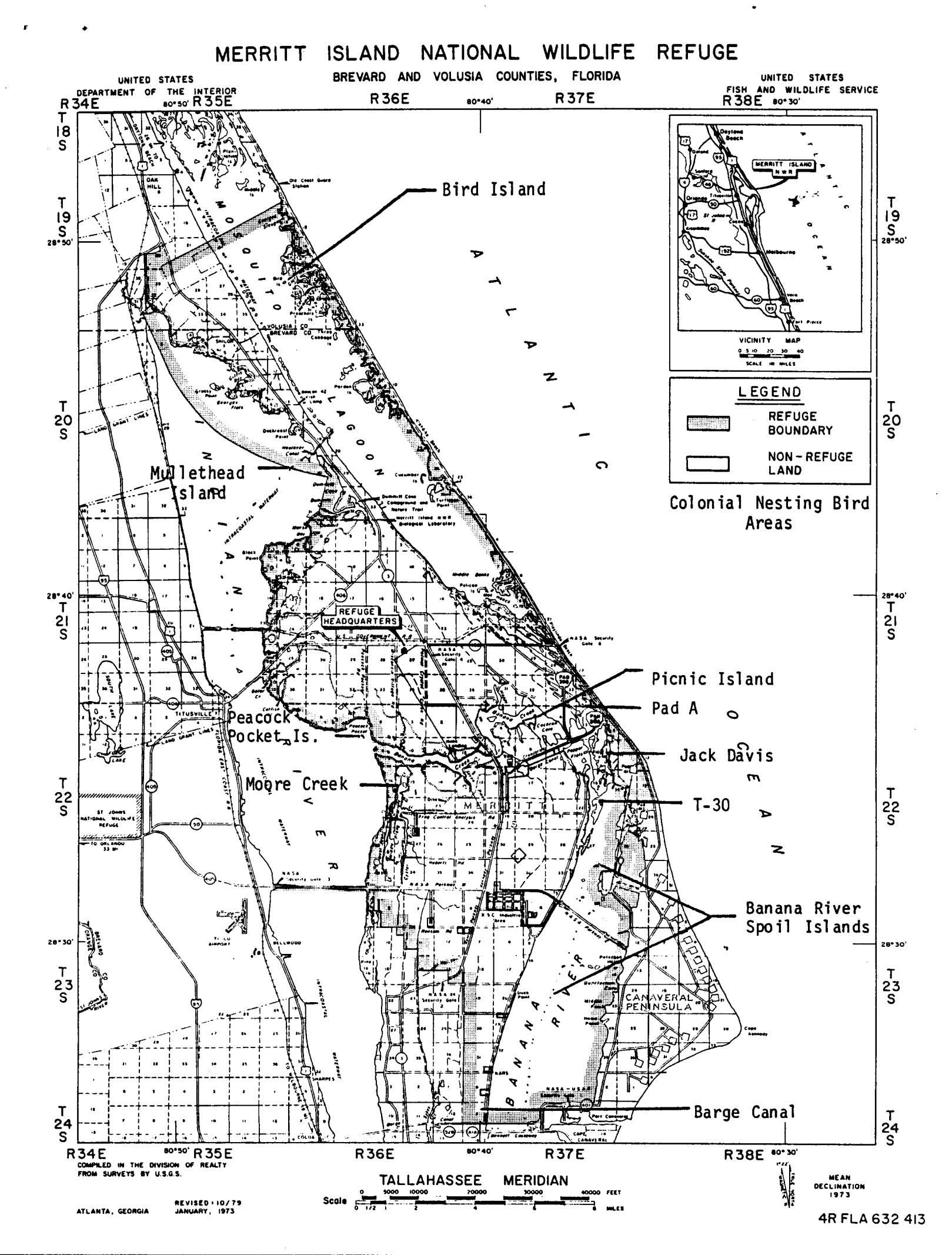
Regional Approval _____ Date: _____

MERRITT ISLAND NATIONAL WILDLIFE REFUGE

BREVARD AND VOLUSIA COUNTIES, FLORIDA

UNITED STATES
DEPARTMENT OF THE INTERIOR

UNITED STATES
FISH AND WILDLIFE SERVICE



COMPILED IN THE DIVISION OF REALTY
FROM SURVEYS BY U.S.G.S.

ATLANTA, GEORGIA

REVISED · 10/79
JANUARY, 1973

TALLAHASSEE MERIDIAN

Scale 0 5000 10000 20000 30000 40000 FEET
0 1/2 1 2 4 6 8 MILES

MEAN DECLINATION 1973

4R FLA 632 413

COLONIAL NESTING BIRD DATA SHEET

(Pairs or Nests)

Date _____

MINWR Rookery	Species															
	WOST	EBPL	GREG	SNEG	CAEG	WHIB	GLIB	TRHE	GRHE	GBHE	REEG	DCCO	ANHI	BCNH	YCNH	LIHE
Bird Island																
Mullethead Island																
Peacock Pocket Is.																
Moore Creek																
Picnic Island																
Pad A																
Jack Davis Island																
T-30																
Barge Canal																
TOTAL MINWR																
TOTAL PINWR																

WOST - Wood Stork
EBPL - E. Brown Pelican
GREG - Great Egret
SNEG - Snowy Egret
CAEG - Cattle Egret
LIHE - Little Blue Heron

WHIB - White Ibis
GLIB - Glossy Ibis
TRHE - Tricolored Heron
GRHE - Green-backed Heron
GBHE - Great Blue Heron

REEG - Reddish Egret
DCCO - Double-crested Cormorant
ANHI - Anhinga
BCNH - Black-crowned Night-Heron
YCNH - Yellow-crowned Night-Heron

BANANA RIVER SURVEY SHEET

(Pairs or Nests)

SLAND	MODU	AMOY	WILL	BNST	LAGU	GBTE	LETE	ROTE	CATE	BLSK	FICR
B											
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											
1											
17											
18											
19											
20											
21											
22											
23											
24											
25											
26											
27											
28											
29											
30											
OTAL											

M O = Mottled Duck
AMOY = Am. Oystercatcher
WILL = Willet
BNST = Black-necked Stilt
LAGU = Laughing Gull
GBTE = Gull-billed Tern
LETE = Least Tern
ROTE = Royal Tern
CATE = Caspian Tern
BLSK = Black Skimmer
FICR = Fish Crow

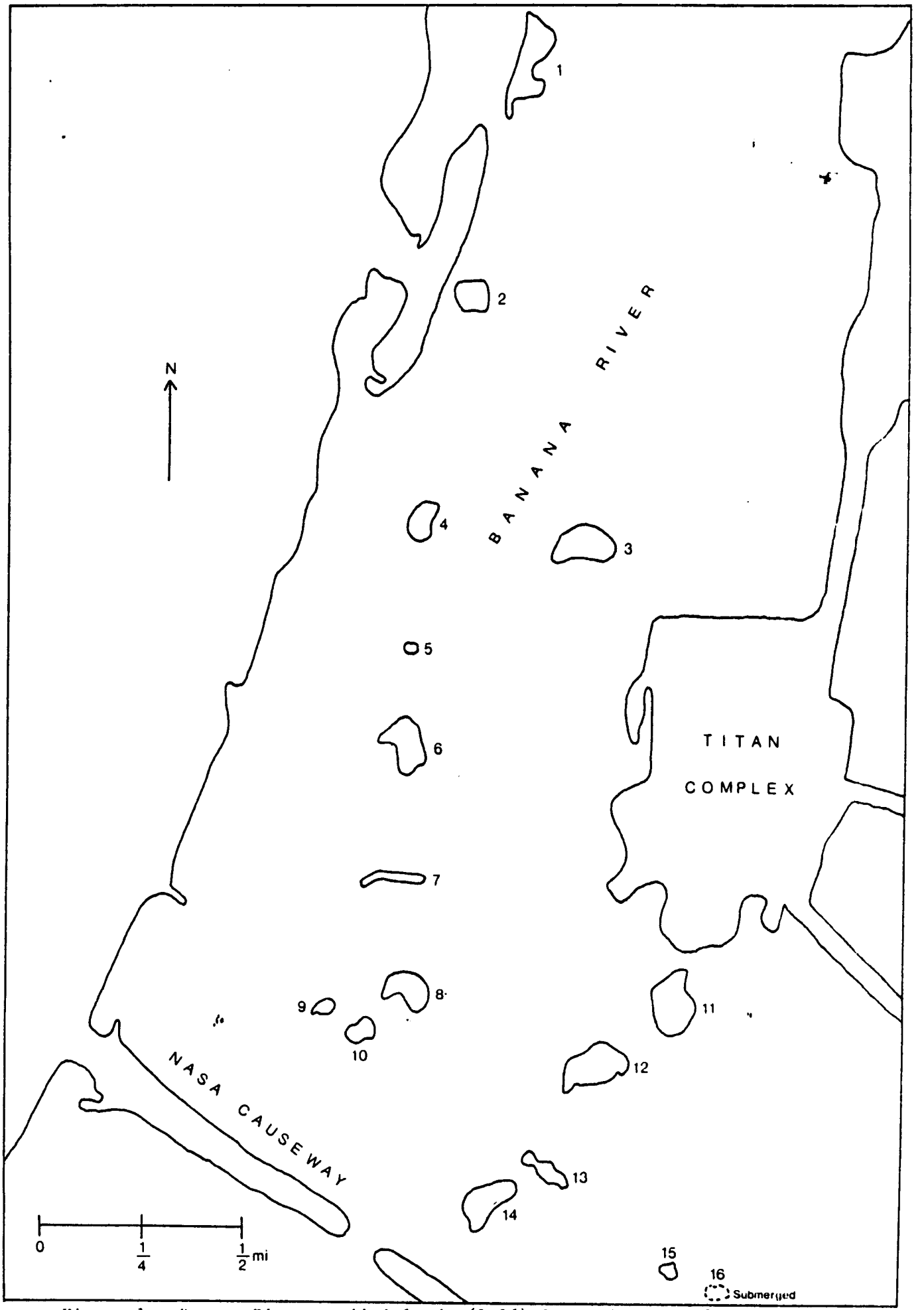


Figure 1. Banana River spoil islands (1-16) located north of the NASA Causeway in the NASA/KSC security area.

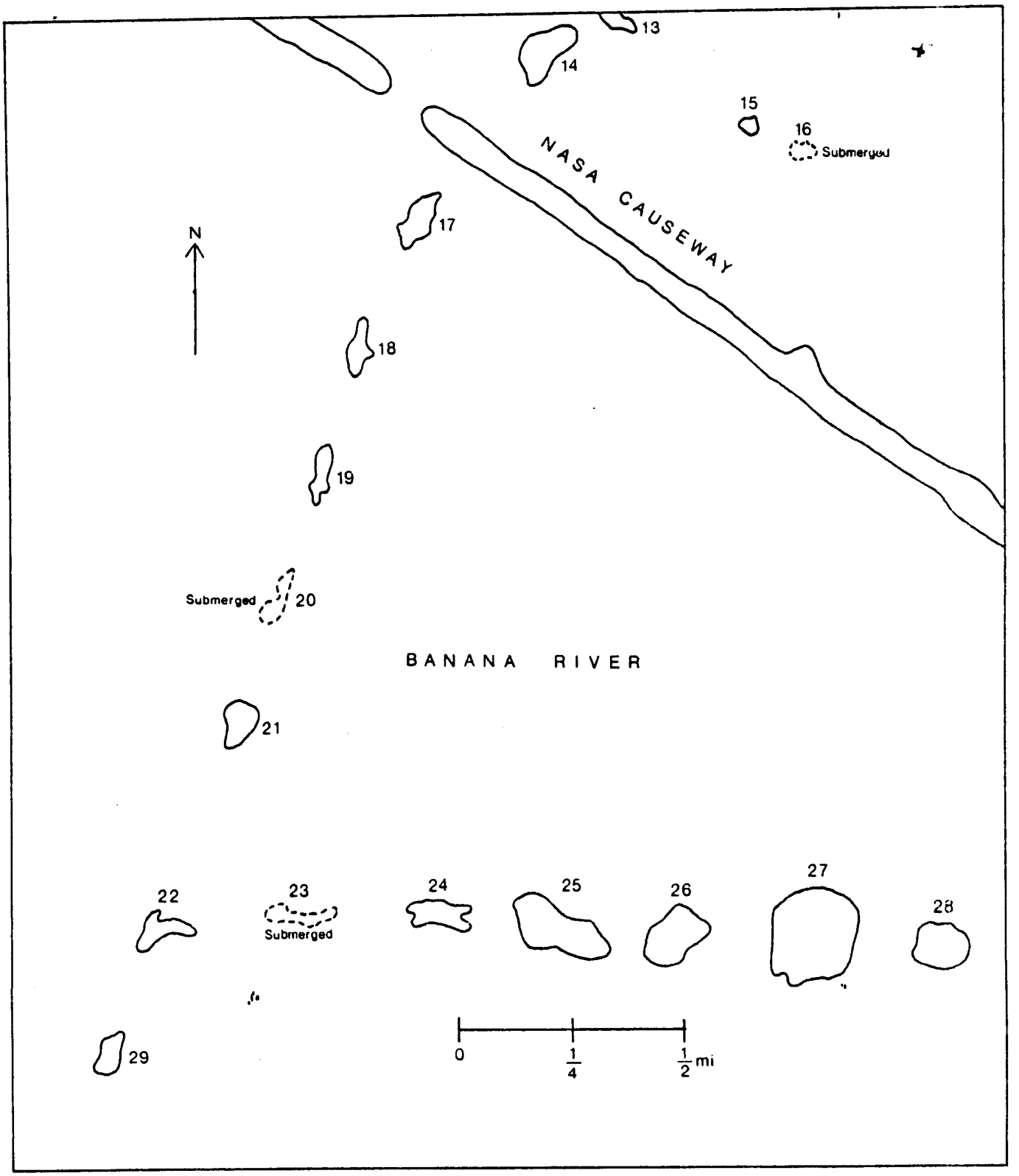


Figure 1 (continued). Banana River spoil islands (17-29) located south of the NASA Causeway.

Figure 1.

Mo. Day Yr. | Time Started | Latitude | Longitude | Colony Size (ha) | Visit No. _____ to this colony for current nesting season

Colony Name: | Subcolony

SPECIES * Common or Scientific Name	Total Population	Total Active Nests	Nesting Stage	Census Technique

Nearest Town:

County:

State/Province/Territory:

Country:

DISTURBANCE

- Human Technology ☐
- Human Habitation ☐
- Human Recreation ☐
- Vehicular Use ☐
- Scientific Invest. ☐

GENERAL COLONY HABITAT _____

OBSERVER: Last name, two initials.

OBSERVER'S ADDRESS:

LAND OWNER'S NAME AND ADDRESS:

REMARKS:

GENERAL COLONY SKETCH:

Refuge: Merritt Island National Wildlife Refuge (MINWR)

Procedure: IP 311-312A

Species: Shore, Marsh and Wading Birds

Title: Shore, Marsh and Wading Bird Survey

I. PURPOSE

This survey is designed to survey the non-breeding and migratory shore, marsh and wading bird populations on the refuge. This survey complements the Colonial Breeding Bird Survey (IP 311-312).

The shore, marsh and wading bird group represent a significant portion of the wildlife utilization on the refuge. Several species in this group are either endangered or threatened species (both Federal and state listings) or Regional Resource Plan species and have therefore been included as top priority species for inventory procedure development when present on a refuge.

II. PROCEDURE AND DATA ANALYSIS

A. Procedure

Because of the diversity of species and habitats covered in this group, 3 different procedures had to be developed to provide a meaningful inventory of the group.

A.1 - Beach Survey

A total ground survey of all birds utilizing the 6.2 mile refuge beach will be made throughout the year (see attached map). From May 15 to September 15 the survey will be done in conjunction with the Marine Turtle Nest Production Survey (IP 702-9140-WR:701-946-WT). During the rest of the year the survey will be conducted on the second and fourth week of the month (September through April). The survey will consist of driving the beach from north to south and counting all the birds seen by species noting large concentrations and unusual sightings. A ATV will be used during the non-turtle bimonthly surveys. A tape recorder or note pad will be needed to record data. A field guide and binoculars would be beneficial for identification of rare, unusual, and distant birds. Care should be used not to recount birds that are rolled up in front of the surveyor. Personnel conducting the survey should be competent in the identification of shorebirds and operation of beach vehicles. One surveyor is needed to conduct the survey. This survey should begin at 0900 and last approximately 1 hour, however the speed of travel is not critical. The survey should be conducted in all types of weather not hazardous to the surveyor or equipment. Data will be recorded on the Beach Shore Bird Survey Data Form (attached).

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Procedure: IP 311-312A

Species: Shore, Marsh and Wading Birds

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A.2 - Wildlife Drive Transect

A total survey of all shore, marsh and wading birds seen from the Black Point Wildlife Drive will be made on the third week of every month (see attached Map). One person experienced in the identification of shore, marsh and wading birds will conduct the survey beginning one hour after sunrise. The surveyor will travel along the wildlife drive in the established direction in a vehicle and record the numbers of all shore, marsh and wading birds seen from the drive and the water level in the impoundment for each impoundment (see attached Wildlife Drive Shore, Marsh and Wading Bird Data Form). . The vehicle can frequently stop and the surveyor can walk the drive for better observations, but the surveyor cannot travel off the established drive. Surveys will be conducted in all weather conditions not hazardous to the surveyor or equipment. Travel speed will be dependent on the number of birds along the route. A vehicle, bird identification field guide, binoculars, and spotting scope will be needed for the survey. Data will be recorded on Field Data Forms (attached). This procedure can be conducted by a volunteer meeting procedure standards.

A.3 - Aerial Wading Bird Survey

A total survey of all wading birds utilizing the marsh and marine habitats of the refuge will be flown twice a year. One observer experienced in the identification of wading birds from the air will accompany an Office of Aircraft Services (OAS) certified or approved pilot in an OAS certified or approved helicopter or fixed winged aircraft. The survey will be conducted on the second week of July and September and take approximately 6 flight hours. The survey should not be conducted if wind speeds exceed 15 mph or if adverse weather conditions such as rain or fog exist. Altitude above the ground level should average 150 ft. and flight speed will very depending on the type of habitat being surveyed, the number of birds, and type of aircraft used. The surveyor will record the number and species of wading birds seen on a portable cassette tape recorder. Sightings will be recorded as seen and assigned to sub-strata (location - refuge, impoundment, area, etc.). Summary data forms will be completed from the recorded data following the survey (attached). The survey should be flown between 0900 and 1300.

B. Data Analysis

The data collected in procedure A.1 and A.2 will be used in determining species utilization and monthly and annual population trends for both beach and impoundment habitats; it is not a refuge population survey. The data will be summarized and compiled annually for reporting in the Annual Narrative. When sufficient data has been collected from each procedure, monthly and annual comparisons can be made.

The data collected in procedure A.3 will be used in determine refuge populations of nonbreeding and migratory wading birds as well as annual trends in the populations. The data will be used in the preparation of RMIS output reports. Wading bird populations by impoundment and impoundment water level and quality data will be compared to determine specific impoundment conditions that favor specific wading bird species. Annual comparisons of the data will be made when sufficient data is available.

C. Data Filing

The data will be filed in the refuge files under WILDLIFE: Shore, Marsh and Wading Bird Survey. A separate file will be maintained for each of the 3 procedures.

III. SPECIAL CONSIDERATIONS

The use of a helicopter over a fixed winged aircraft is preferable since it will not be possible to stratify the wading bird population data by impoundments with a fixed winged aircraft. The aerial observer should wear dark clothing to avoid reflection in the window, dark glasses, and may fly with an open door of the helicopter or airplane window for better visibility. It is preferable that the same individual conduct each of the 3 procedures.

IV. MANPOWER AND COST

Cost estimates do not include procedure A.1 conducted in conjunction with the beach turtle operations (May - September). Personnel costs can be reduced by using a volunteer for procedure A.2.

Personnel (140 staff-hours)	$ 1700.00
Equipment	
A.1 Vehicle operations and maintenance	300.00
A.2 Vehicle operations and maintenance	100.00
A.3 Aircraft (at $ 160/hr. for helicopter)	960.00
Other expenses	
Consumable supplies	50.00
TOTAL	$ 3110.00

Prepared by: Bill Leenhouts Date: 06-05-85

Reviewed by: _____ Date: _____

Refuge Approval: _____ Date: _____

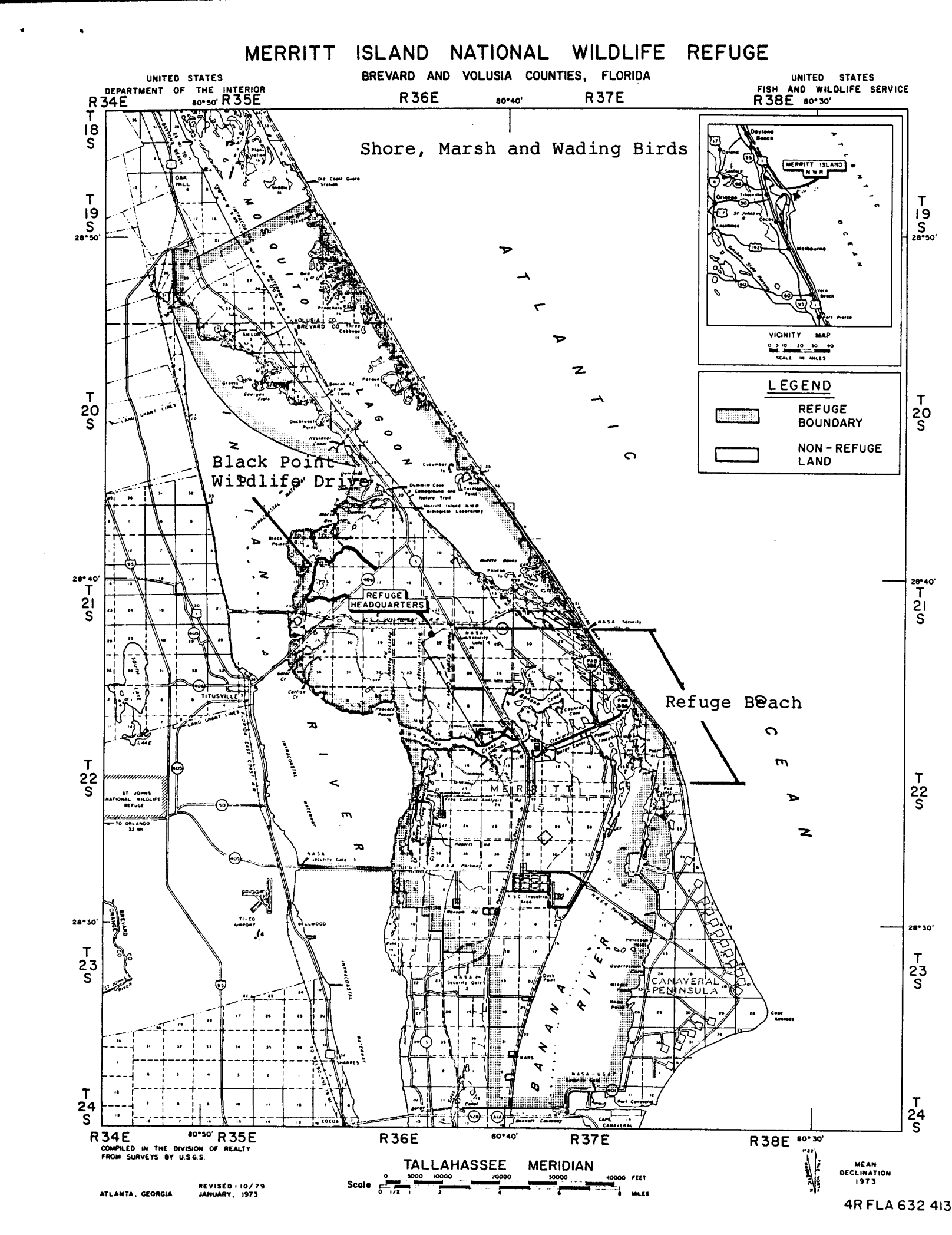
Regional Approval: _____ Date: _____

MERRITT ISLAND NATIONAL WILDLIFE REFUGE

BREVARD AND VOLUSIA COUNTIES, FLORIDA

UNITED STATES
DEPARTMENT OF THE INTERIOR

UNITED STATES
FISH AND WILDLIFE SERVICE



4R FLA 632 413

BEACH SHORE BIRD SURVEY DATA FORM

Date: ____________________

Observer: ____________________

Weather: ____________________

Wind: ____________________

Air temperature: ____________________

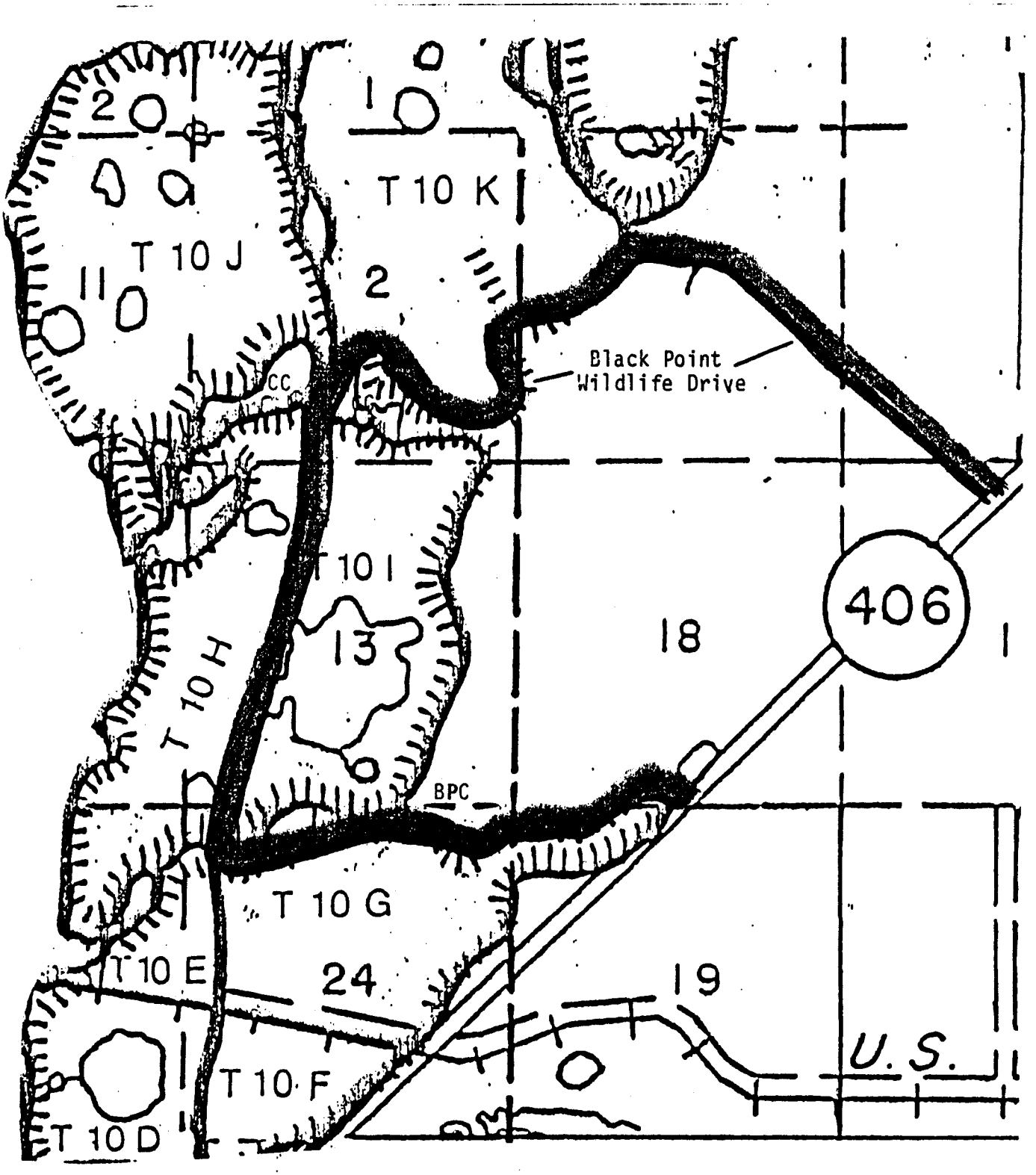
Start time: ____________________

Stop time: ____________________

General conditions: ____________________

SPECIES	NUMBER SEEN

Impoundment Locations Along Wildlife Drive



WILDLIFE DRIVE SHORE, MARSH AND WADING BIRD DATA FORM

Date: ______________________________

Observer: ______________________________

Weather: ______________________________

Wind: ______________________________

Air temperature: ______________________________

Start time: ______________________________

Stop time: ______________________________

General conditions: ______________________________

NUMBERS SEEN IN EACH IMPOUNDMENT

SPECIES	BPC	T10G	T10E	T10H	T10I	T10K	CC	TOTAL
Water Level	XXXXXX						XXXXXX	XXXXXXX

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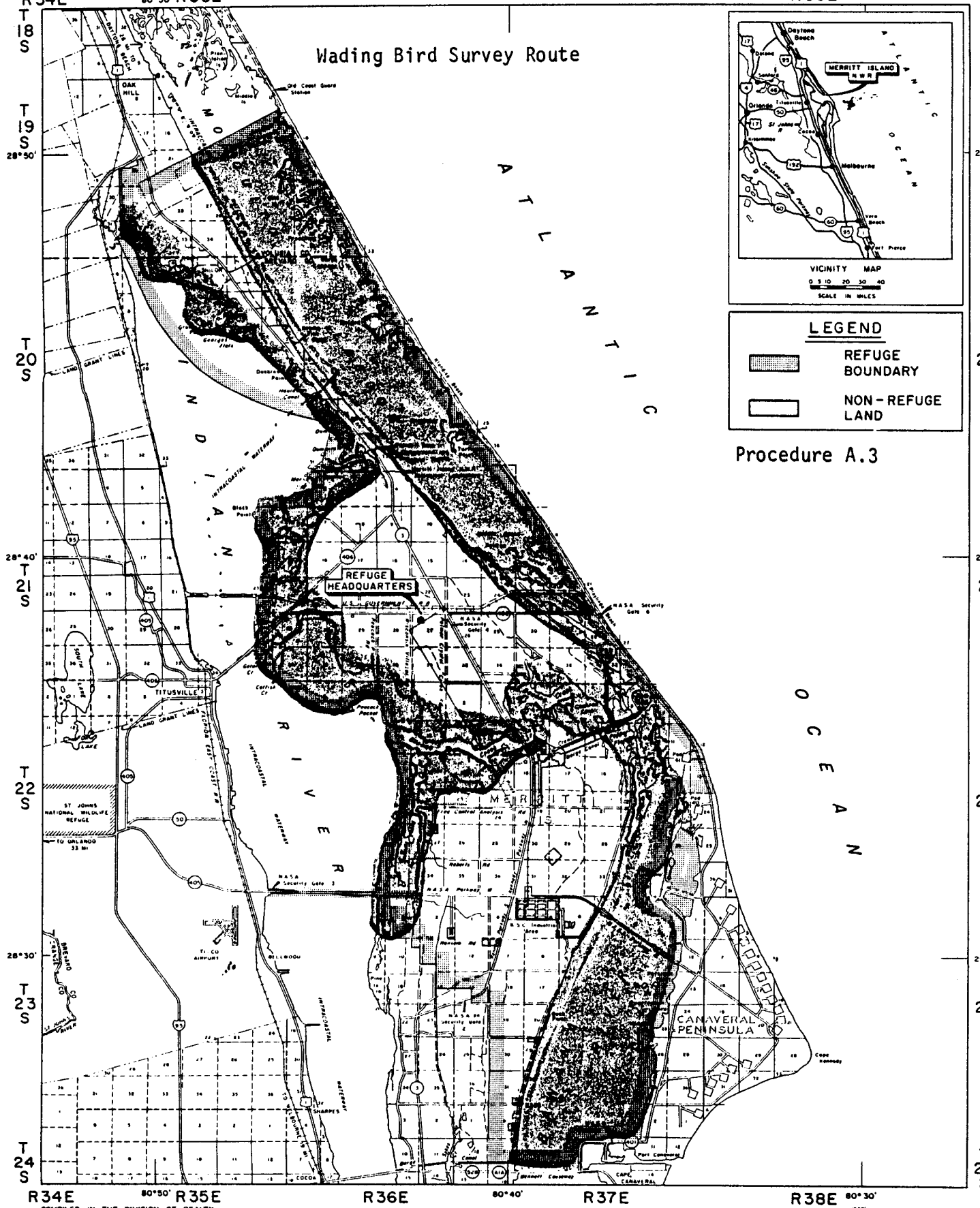

LEGEND

REFUGE BOUNDARY

NON-REFUGE LAND

Procedure A.3

COMPILED IN THE DIVISION OF REALTY
FROM SURVEYS BY U.S.G.S.

ATLANTA, GEORGIA

REVISED: 10/79
JANUARY, 1973

TALLAHASSEE MERIDIAN

Scale 0 5000 10000 20000 30000 40000 FEET
0 1/2 1 2 4 6 8 MILES

MEAN DECLINATION 1973

4R FLA 632 413

Aerial Wading Bird Survey

Refuge Merritt Island Nat. Wildlife Refuge Dates _____

Description of Conditions During Survey _____

Management Unit 1

Shiloh 5 _____
Shiloh 3 _____
Shiloh 1 _____
T-21 _____
V-1 _____
V-2 _____
T-44 _____
T-43 _____
T-42 _____
Indian Rv. _____
Mosq. Lag. _____

Management Unit 2

T-9 _____
T-10-M _____
T-10-L _____
T-10-K _____
T-10-J _____
T-10-I _____
T-10-H _____
T-10-G _____
T-10-F _____
T-10-F _____
T-10-E _____
T-10-D _____
T-10-C _____
T-10-B _____
T-10-A _____
Gator Ck. _____
Indian Rv. _____

Aerial Wading Bird Survey

Management Unit 3

T-41 _____
T-40 _____
T-39 _____
T-39-So. _____
T-38 _____
T-27-A _____
T-27-B _____
T-27-C _____
Mosq. Lag. _____

Management Unit 4

Gator Ck. _____
T-24-A _____
T-24-B _____
T-24-C _____
T-24-D _____
T-16 _____
T-17 _____
T-18-A _____
T-18-B _____
Indian Rv. _____
Banana Ck. _____

Management Unit 5

T-27-D _____
T-34 _____
T-35 _____
T-37-A _____
T-37-B _____
C-21 & 36 _____
T-33-A _____
T-33-B _____
T-33-C _____
T-29-A _____
T-29-B _____
T-25-A _____
T-25-B _____
Banana Ck. _____

Aerial Wading Bird Survey

Management Unit 6

C-20-C _____
C-20-B _____
C-20-A _____
Moore Ck. _____
C-15-D _____
C-15-C _____
C-15-E _____
Indian Rv. _____

Management Unit 7

C-28-A _____
C-28-B _____
T-30 _____
C-21-B _____
Banana Rv. _____

Management Unit 8

C-15-CB _____
Indian Rv. _____

Management Unit 9

Banana Rv. _____

TOTAL for MINWR _____

1LM10;LL65
Refuge: Merritt Island National Wildlife Refuge

Procedure: IP 071 4790 WR

Species: Florida scrub jay (Aphelocoma coerulescens coerulescens)

Title: Florida Scrub Jay Census

I. PURPOSE

The purpose of this census is to determine and monitor on an annual basis the population and range of Florida scrub jays on the Merritt Island National Wildlife Refuge. This data will be useful to determine if Florida scrub jay population changes are due to refuge management practices (ie. forest and fire management).

Best Florida scrub jay habitat is open mixed oak scrub; although, they can be found in saw palmetto scrub, strand, and slash pine flatwoods habitats of the refuge. The mixed oak habitat type is quite limited (3667 acres) on the refuge. This habitat type is also most suitable for NASA development and may be susceptible to ecological change from fire. Monitoring Florida scrub jay population will also provide an index of mixed oak scrub changes.

II. PROCEDURE AND DATA ANALYSIS

A. Procedure

Two procedures will be needed: one to determine the population and and one to determine the range.

1) Florida scrub jays will be censused along 18 - 0.5 mile transects established in known Florida scrub jay habitat along existing roads and firebreaks (Figure 1) (Table 1). An observer with 7 X 35 mm binoculars will walk along a transect stopping every 0.1 miles to record the number of jays observed or heard. This will result in 6 observations per transect. At each stop a cassette tape of Florida scrub jay alarm calls will be played for 120 seconds to attract jays into view where they can be counted. The open aspect of Florida scrub jay habitat and their territorial behavior reduce the probability that individuals will be recounted. Approximately 30 minutes are required to survey one transect. Censuses will be conducted in June, July, and August and only on non-rainy days with little or no wind usually between 0730 and 1030. Each transect will be censused 3 times annually; once each month. The number of juvenile and adult birds and the distance the farthest bird is seen will be recorded at each of the 6 stations along each transect. Juveniles can be distinguished from adults by their gray plumage prior to completion of the post-juvenal molt in late summer.

2) The presence or absence of Florida scrub jays will be recorded at each visit to each survey plot of Wildlife Management Study 41570-03, "Monitoring Forest Habitat Dynamics on the Merritt Island National Wildlife Refuge". This will

provide a estimate of the range of the Florida scrub jay and changes in the range through time. There will be survey plots throughout the forest habitat of the refuge by 1987 at a density of 1 plot per 200 acres and each plot will be monitored every 3 years.

B. Data Analysis

A population estimate will be determined by extrapolating the density of jays found on the transects to the total amount of Florida scrub jay habitat on the refuge: 28,100 acres (Salata, L. R. 1980. Florida scrub jay census: Merritt Island National Wildlife Refuge. 10pp. memio.). The highest count of jays for any given transect will be used to compute density estimates for each transect. Maxima values will be used rather than means because they usually occurred on days with the best observation conditions and are probably the best indication of the number of jays actually present.

A density estimate for each transect will be computed using the Hayne strip census estimator. This is accomplished using the following formula:

Scrub Jays/Acre = (# Scrub Jays X Maximum Distance (ft.) X 5280) / 43560

An average density estimate for each habitat type and for the entire refuge will be determined by combining all the transect densities in each habitat type and combining all transects densities respectively. The total population estimate (average density for the refuge X 28100 acres) for the refuge will be determined and used in RMIS output reports.

Florida scrub jay ranges will be determined from Wildlife Management Study 41570-03. If significant populations are detected outside Florida scrub jay transect locations, additional transects will be added in the area of these populations.

C. Data Filing

Individual data sheets and summarized reports will be filed in the refuge files under WILDLIFE: Florida Scrub Jay - Inventory Results.

III. SPECIAL CONSIDERATIONS

None.

IV. MANPOWER AND COSTS

Personnel (76 staff-hours)	$ 1000.00
Transportation	100.00
Equipment	
Office supplies, batteries, tape recorder, tapes, etc.	110.00

MERRITT ISLAND NATIONAL WILDLIFE REFUGE

BREVARD AND VOLUSIA COUNTIES, FLORIDA

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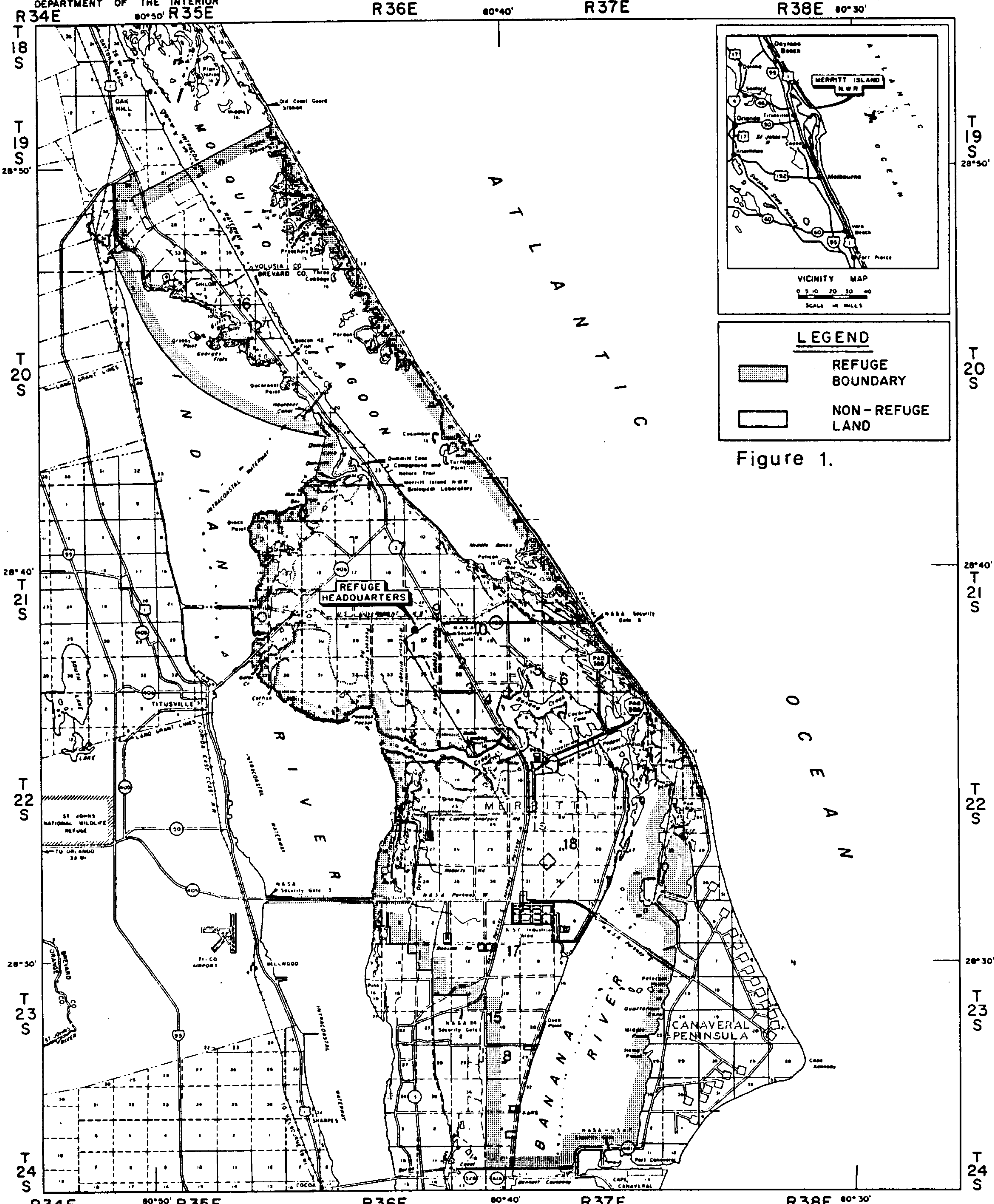


R34E
80°50' R35E
R36E
80°40'
R37E
R38E 80°30'
T 18 S
T 19 S
28°50'
T 20 S
28°40'
T 21 S
T 22 S
28°30'
T 23 S
T 24 S
ATLANTIC
OCEAN
MOSQUITO LAGOON
INDIAN RIVER
BANANA RIVER
MERRITT
CANAVERAL PENINSULA
REFUGE HEADQUARTERS
INTRACOASTAL WATERWAY
TITUSVILLE
OAK HILL
SHILOH
VOLUSIA CO.
BREVARD CO.
LAND GRANT LINES
SOUTH LAKE
ST. JOHNS NATIONAL WILDLIFE REFUGE
TO ORLANDO 33 MI
TI-CO AIRPORT
BELLWOOD
SHARPES
COCOA
PORT CANAVERAL
CAPE CANAVERAL
BREVARD CO.
ORANGE CO.
VICINITY MAP
Daytona Beach
MERRITT ISLAND NWR
Orlando
Titusville
Cocoa
Melbourne
Vero Beach
Fort Pierce
ATLANTIC OCEAN
LEGEND
REFUGE BOUNDARY
NON-REFUGE LAND
R34E
80°50' R35E
R36E
80°40'
R37E
R38E 80°30'

Figure 1.

COMPILED IN THE DIVISION OF REALTY
FROM SURVEYS BY U.S.G.S.

TALLAHASSEE MERIDIAN

Scale 0 5000 10000 20000 30000 40000 FEET
0 1/2 1 2 4 6 8 MILES

MEAN DECLINATION 1973

ATLANTA, GEORGIA

REVISED: 10/79
JANUARY, 1973

4R FLA 632 413

TOTAL $ 1210.00

Prepared by: Bill Leenhouts Date: 11-27-84

Reviewed by: _____ Date: _____

Refuge Approval: _____ Date: _____

Regional Approval: _____ Date: _____

Table 1. Transect locations.

1 - 0.8 miles south of Security Gate 4, north along SR 3 for 0.5 miles. (Pineless Flatwoods)

2 - The intersection of SR 3 and Happy Creek Rd., north along SR 3 for 0.5 miles. (Pineless Flatwoods)

3 - The intersection of SR 3 and Sharkey Rd., north along SR 3 for 0.5 miles. (Coastal Scrub)

4 - The intersection of SR 3 and Astronaut Rd., north along SR 3 for 0.5 miles. (Coastal Scrub)

5 - Approximately 250 yards west of Camera Pad 16 in the Happy Creek area, west along a paved road for 0.5 miles. (Coastal Scrub)

6 - Camera Pad 16 in the Happy Creek area, east along a sandy road for 0.5 miles. (Coastal Scrub)

7 - 0.8 miles southerly of the intersection of SR 3 and SR 406, north along SR 3 for 0.5 miles. (Pineless Flatwoods)

8 - Approximately 100 yards west of Weather Tower 5 adjacent to Tel 4 Rd., south along a firebreak for 0.5 miles. (Pine Flatwoods)

9 - 0.3 miles northwest of the intersection of SR 3 and SR 402, north along SR 3 for 0.5 miles. (Pineless Flatwoods)

10 - 0.8 miles east of the intersection of SR 3 and SR 402 , east along SR 402 for 0.5 miles. (Pineless Flatwoods)

11 - 0.5 miles long; from the end of the paved road directly adjacent to the northeast corner of Wildlife Sampling Area No. 1, west along a sandy road then south along Wisconsin Village Road. (Pineless Flatwoods)

12 - 3.4 miles north of Haulover Canal, south along SR 3 for 0.5 miles. (Pine Flatwoods)

13 - 1 miles north of the KSC - CCAFS boundary, south along the Beach Rd. for 0.5 miles. (Coastal Strand)

14 - 0.8 mile north of Launch Complex 41, south along the Beach Road for 0.5 miles. (Coastal Strand)

15 - Approximately 100 yards east of the intersection of Tel 4 Rd. and SR 3, south along Tel 4 Rd. for 0.5 miles. (Pine Flatwoods)

16 - Approximately 3 miles north of Haulover Canal along SR 3, east along a sandy road for 0.5 miles. (Pine Flatwoods)

17 - 1 mile east of the intersection of SR 3 and Ransom Rd., west along Ransom Rd. for 0.5 miles. (Pine Flatwoods)

18 - 1 mile south of Swartz Rd. along the east side of the KSC landfill, south along a firebreak for 0.5 miles. (Coastal Scrub)

Habitat types classified according to Stout (1979) and provided in Salata (1980).

FLORIDA SCRUB JAY DATA SHEET

Date _____

Time _____

Observer _____

Transect Number _____

Station	Adult	Juvenile	Unknown	Distance
0				
1				
2				
3				
4				
5				
Total			=	

Quail _____

Refuge: Merritt Island National Wildlife Refuge (MINWR)

Procedure: IP 701 3521 WT

Species: Southern Bald Eagle (Haliaeetus leucocephalus leucocephalus)

Title: Bald Eagle Status and Production Survey

I. PURPOSE

The southern bald eagle is of special concern to the refuge because it has been listed as an endangered species and there is a small breeding population on the refuge. The purpose of this study is to determine the location and number of active bald eagle nests on the refuge, the number of successful and unsuccessful nesting attempts, and fledging success per active territory. The data will be used to determine annual base population levels, annual productivity, productivity changes, and population trends.

II. PROCEDURE AND DATA ANALYSIS

A. Procedure

Since the location of most active nesting territories are known, it will only be necessary to examine the nest sites on a periodic basis. This will be done in a method as to minimize the disturbance especially before hatching. Between October and May volunteers skilled in bird and bird behavior observation will monitor the status of all active bald eagle nests (nests which have been active in the past two years) and develop a chronological record of nest activity. If volunteers cannot be found, refuge personnel will once a month check each active nest site and record nest activity.

The volunteer monitor will be instructed by refuge personnel as to the proper technique to approach and monitor each nest and the data which is needed. Government transportation to and from the nest sites will be provided. Optical equipment needed to observe the nest will be provided by the volunteer. Four wheel drive is needed to gain access to some of the nest sites and binoculars and/or spotting scopes are needed to successfully observe the nest and eagle nesting activity. Security clearance will be obtained by the refuge for the volunteer monitoring nests within the KSC security area. Volunteer monitors will be matched with nest sites by refuge personnel based on compatibility of equipment to the site.

All reports of new nests on the refuge will be checked by refuge personnel and those confirmed will be added to the refuge active nest status inventory. To make sure that no new nest goes undetected, all the pine flatwoods will be aerially surveyed once a year to look for any new nest. This survey will be conducted in the first week of February to avoid disturbance. A volunteer monitor will be found to monitor all new nests.

The aerial survey will be made in an OAS certified or approved aircraft with and OAS certified or approved pilot. The survey will be conducted between 0900 and 1500 and adverse weather should be avoided. One refuge person familiar with

aerial location of eagle nests on the refuge is required to conduct the aerial nest survey. Aerial observations should be recorded on a tape recorder for ease and accuracy. Aerial photographs of all nest trees will be taken to pinpoint the location and to update the Bald Eagle Status notebook of the refuge.

B. Data Analysis

The data analysis will determine the total productivity of the active territories and successful nests. Total productivity of the refuge is the total number of young fledged from all nests of the refuge. Productivity per nest will also be determined. New nest sites will be added to the Bald Eagle Status notebook maintained at the refuge headquarters. Inactive nests will be deleated from the active and added to the inactive status section of the notebook.

C. Data Filing

A summary of each years eagle production and nest locations will be filed in the refuge files under WILDLIFE: Bald Eagle Survey.

III. SPECIAL CONSIDERATIONS

It is important that dedicated and skilled volunteers be obtained to monitor the eagle nests. Early recruitment would be helpful in obtaining these volunteers. Proper orientation and training by refuge personnel is also important.

VI. MANPOWER AND COSTS

Personnel	
Volunteer orientation and training (8 staff-hours)	$ 100.00
Aerial Survey (4 staff-hours)	50.00
Data Analysis (8 staff-hours)	125.00
Transportation	
Aerial Survey (4 hours)	200.00
Ground	100.00
Other supplies (equipment and fuel)	120.00
TOTAL	$ 695.00

Prepared By: Bill Leenhouts Date: 03-26-84

Reviewed By: _____ Date _____

Refuge Approval: _____ Date _____

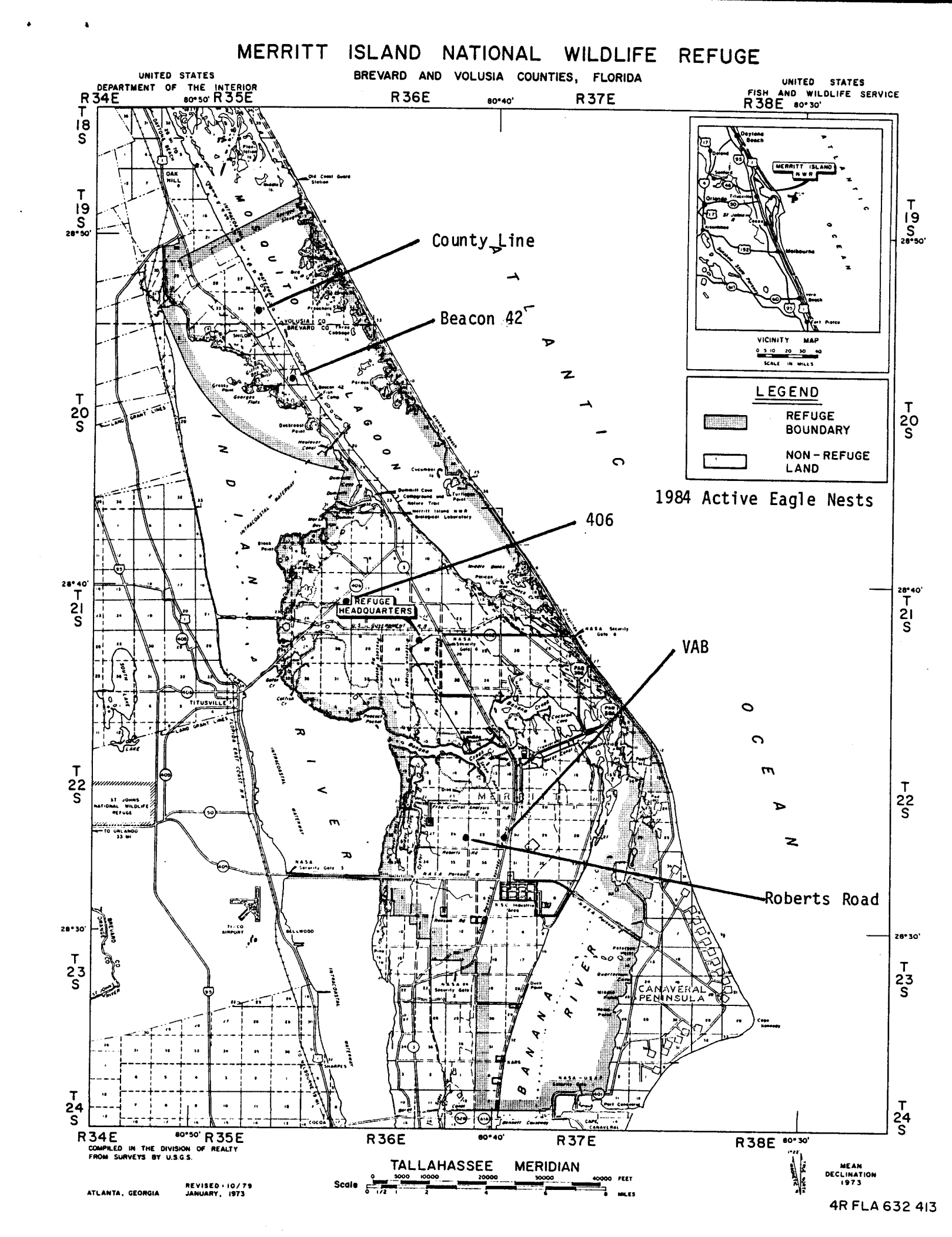
Regional Approval: _____ Date _____

MERRITT ISLAND NATIONAL WILDLIFE REFUGE

BREVARD AND VOLUSIA COUNTIES, FLORIDA

UNITED STATES
DEPARTMENT OF THE INTERIOR

UNITED STATES
FISH AND WILDLIFE SERVICE



LEGEND

- REFUGE BOUNDARY
- NON-REFUGE LAND

1984 Active Eagle Nests

COMPILED IN THE DIVISION OF REALTY
FROM SURVEYS BY U.S.G.S.

ATLANTA, GEORGIA

REVISED: 10/79
JANUARY, 1973

TALLAHASSEE MERIDIAN

Scale 0 5000 10000 20000 30000 40000 FEET
0 1/2 1 2 4 6 8 MILES

MEAN DECLINATION 1973

4R FLA 632 413

Refuge: Merritt Island National Wildlife Refuge (MINWR)

Procedure: IP 704 3640 WU

Species: Osprey (Pandion haliaetus)

Title: Annual Osprey Survey

I. PURPOSE

To monitor the location, number, and productivity of the active osprey nests on the MINWR annually.

II. PROCEDURE

An aerial survey will be conducted once a year over the entire refuge to locate all active osprey nests. The survey will be conducted during the breeding season following hatching (second week in May). All historic nests will be checked and as well as a survey for new nests. The survey should be conducted between 0900 and 1500 for best visibility. Rain and adverse weather should be avoided. One or two people familiar with the breeding habits and location of active nests on the refuge are required. The survey should be conducted from a two or four seat fixed winged or rotary OAS certified or approved aircraft with a OAS certified or approved pilot. During the survey a clipboard, pencil, Osprey Nest Data Sheet (enclosed), a map of last years active nests, and a blank refuge map will be needed.

Record on the Osprey Nest Data Sheet the requested information and locate all nests on the blank refuge map.

B. Data Analysis

An annual summary of the data will be developed. This summary will include a map and table showing all nest sites. A written report highlighting concentration areas, unusual sightings, number of new nests, number of old nests still active from last year, number of old nests not active from last year, and estimated productivity (number of young per active nest).

C. Data Filing

Survey maps indicating location and numbers of nests, field data sheets, and the annual summary will be kept in the refuge files under WILDLIFE: Aerial Osprey Survey.

III. SPECIAL CONSIDERATIONS

The observer(s) should wear dark clothing to avoid reflection in the window, dark glasses, and may fly with an open door of the helicopter or airplane window open for better visibility. Circle and check carefully all nests to determine the number of eggs or nestlings. Circle to the right in fixed winged airplane. Caution should be used when using a helicopter near osprey nests.

VI. MANPOWER AND COST

Personnel (16 staff-hours)	$ 200.00
Equipment (Aircraft rental)	300.00
Other supplies	50.00
TOTAL ANNUAL COST	$ 550.00

Prepared by: Bill Leenhouts Date: 04-12-85

Reviewed by: _____ Date: _____

Refuge Approval: _____ Date: _____

Regional Approval: _____ Date: _____

OSPREY NEST DATA SHEET

Date: _____
Observers: _____
Pilot: _____
Weather: _____
Wind: _____
Air temperature: _____
Start time: _____
Stop time: _____
General conditions: _____

NEST NUMBER	NUMBER OF YOUNG	NEST NUMBER	NUMBER OF YOUNG

Refuge: Merritt Island National Wildlife Refuge (MINWR)

Procedure: IP 313

Species: Raptorial Birds (Falconiformes)

Title: Migratory Raptor Survey

I. PURPOSE

The primary purpose of this survey is to determine the status of the migratory raptors through the refuge. The Arctic peregrine falcon is of special concern because it is listed as an endangered species and frequently migrates through the refuge during fall months. Additional data will be gathered on the numbers of migratory peregrine falcons visiting the refuge each year.

II. PROCEDURE AND DATA ANALYSIS

A. Procedure

During the months of September, October, and November a survey will be conducted to determine population trends of migrating raptors through the refuge. Annually volunteers will census the number of migrating raptors passing Camera Pad 10 north of Playalinda Beach from 0700 to 1100 at least three times a week every week during the above three months. Surveys should be conducted in all types of weather as a sample of all conditions is most useful.

Only birds seen with the unaided eye will be recorded, although binoculars and spotting scopes can be used to identify the bird. Age class (adult or immature) should be noted and recorded for turkey and black vultures, marsh hawks, bald eagles, and peregrine falcons. Known resident birds are not to be counted. (Birds that cross the study site in one direction and then return.

Daily observations and environmental data will be recorded on the Raptor Survey Data Sheet (attached). In addition to the number of birds observed, the age class of the above mentioned species is also recorded. The number of birds in reverse migration (from south to north) should also be noted, and indicated by a (n) on the data sheet.

B. Data Analysis

At the end of the survey year, the data gathered will be transfered to the Raptor Survey Summary Sheet (attached) to ease analysis and reduce the bulk of paperwork. Calculations of the number of each species observed per hour and the mean number of total birds observed per hour for the study period will be made.

C. Data Filing

The Raptor Survey Data Sheets and annual summary will be filed in the refuge files under WILDLIFE: Migatory Raptor Survey.

III. SPECIAL CONSIDERATIONS

This survey will be conducted by experenced volunteers and if no volunteers are available, than the survey will not be conducted at all. Camera Pad 10 is north of Playalinda Beach and security arrangements will need to be coordinated with Canaveral National Seashore for access.

IV. MANPOWER and COST

Personnel	
Refuge Staff - Coordination (16 staff-hours)	$ 175.00
Refuge Staff - Data Analysis (8 staff-hours)	125.00
Volunteers - Field Survey	0.00
Transportantion	200.00
Equipment - binoculars, spotting scopes, etc.	100.00
TOTAL	$ 600.00

Prepared By: Bill Leenhouts Date: 03-26-84

Reviewed By: _____ Date: _____

Refuge Approval: _____ Date: _____

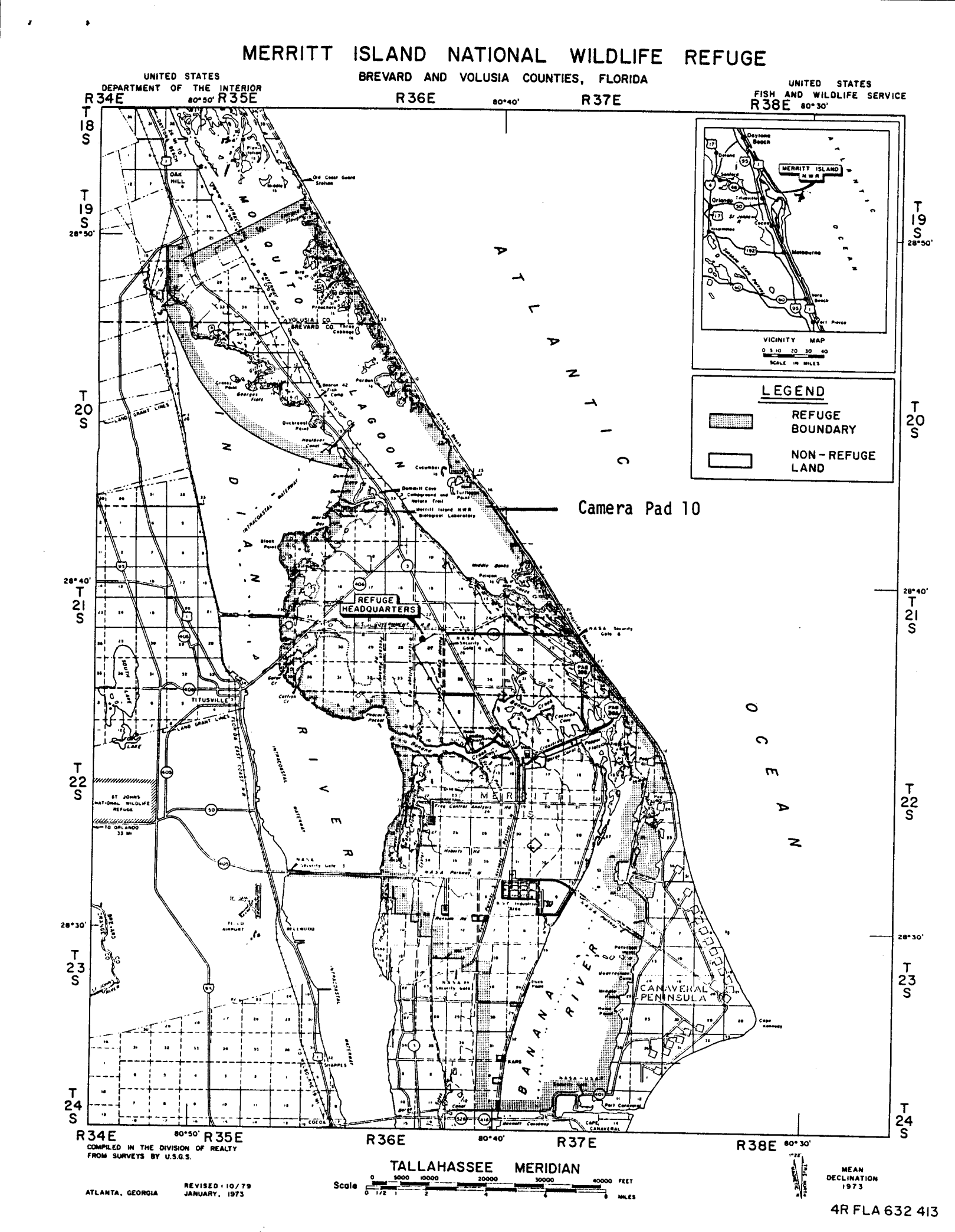
Regional Approval _____ Date: _____

MERRITT ISLAND NATIONAL WILDLIFE REFUGE

BREVARD AND VOLUSIA COUNTIES, FLORIDA

UNITED STATES
DEPARTMENT OF THE INTERIOR

UNITED STATES
FISH AND WILDLIFE SERVICE



LEGEND

- REFUGE BOUNDARY
- NON-REFUGE LAND

COMPILED IN THE DIVISION OF REALTY
FROM SURVEYS BY U.S.G.S.

ATLANTA, GEORGIA

REVISED: 10/79
JANUARY, 1973

TALLAHASSEE MERIDIAN

Scale 0 5000 10000 20000 30000 40000 FEET
0 1/2 1 2 4 6 8 MILES

MEAN DECLINATION 1973

4R FLA 632 413

RAPTOR SURVEY DATA SHEET

Date _____ Time: Start _____ Stop _____

Observer: _____

Location: _____

Wind Speed (knot) _____ Wind Direction (deg) _____

Temperature (C) _____ Cloud Cover (%) _____

Relative Humidity (%) _____ Barometric Pressure (cm hg) _____

Turkey Vulture	
Black Vulture	
Sharp-shinned Hawk	
Cooper's Hawk	
Red-tailed Hawk	
Bald Eagle	
Marsh Hawk	
Osprey	
Peregrine Falcon	
Merlin	
American Kestrel	
Accipiter sp.	
Buteo sp.	
Falcon sp.	
Other	
Other	

Notes:

Refuge: Merritt Island National Wildlife Refuge (MINWR) and St. Johns National Wildlife Refuge (SJNWR)

Procedure: IP 314

Species: Breeding Birds

Title: Breeding Bird Census

I. PURPOSE

To determine the species, numbers and utilization of the salt marsh community by breeding birds on the MINWR and SJNWR. This information will be invaluable in determining the future management objectives of the refuges and be included in the National Breeding Bird Census data bank compiled by the National Audubon Society.

II. PROCEDURE AND DATA ANALYSIS

A. Procedure

This census is a standard Audubon Breeding Bird Census as outlined in Hall, G. A. 1964. Breeding bird census - why and how. Aud. Field Notes. 18(3):413-413. and Van Velzen, W. T. 1972. Breeding-bird census instructions. Am. Birds 26(6):1007-1010. 3 study areas of approximately 25 ha. in size have been established - 1 on each unit of the SJNWR and 1 on MINWR. Each study area has been cover mapped. A permanent grid system is established on the 2 SJNWR study areas. The grid system consists of 25 stations (5 square) each separated by 100m. A 2140 m. transect is established on the MINWR. (See maps.)

The person conducting the census will walk from station to station or along the transect and record the location on field maps of all birds seen and/or heard in the study area. All additional information concerning each bird seen in the area will be recorded (i.e. species, sex, territorial defense). A different field map will be used on each census trip. All maps will be combined and data compiled at the end of the census.

A minimum of 10 census trips will be made to each study area between late April and early June. At least 5 of these trips will be within a week or two of the height of the nesting season. Early morning censuses are most productive, however, late afternoon and night censuses should also be conducted to observe all bird species. Rainy and windy days (greater than 15 mph) should be avoided. Any trip not completed by adverse weather will be completed the following day or recensused.

Volunteers experienced in visual and auditory recognition of birds will be used for the field censuses and data compilation. Refuge personnel will provide technical assistance, orientation and assist in data compilation.

Travel to and from the sites can be made with standard 2 wheel drive vehicles. Foot travel is needed to reach transect and to conduct the survey.

B. Data Analysis

The data will be analyzed according to standard Audubon Breeding Bird Census format (Breeding Bird Census Instructions attached) and submitted to American Birds for publication. A comparison between each study site will be conducted. The data will also be used in determining future habitat management objectives.

C. Data Filing

A copy of the breeding bird census sent to American Birds will be filed in the refuge files under WILDLIFE: Breeding Bird Census.

III. SPECIAL CONSIDERATIONS

This procedure will be performed by volunteers with refuge personnel providing guidance only. If no volunteers are available, the inventory will not be conducted.

Volunteer personnel		
Field survey (150 hours)	$	0.00
Data Analysis (12 hours)		0.00
Refuge personnel		
Orientation and coordination (16 staff-hours)		270.00
Data analysis (16 staff-hours)		270.00
Transportation		300.00
Equipment and supplies		
Office supplies, etc.		50.00
TOTAL	$	890.00

Prepared by: Bill Leenhouts Date: 03-07-84

Reviewed by: _____ Date: _____

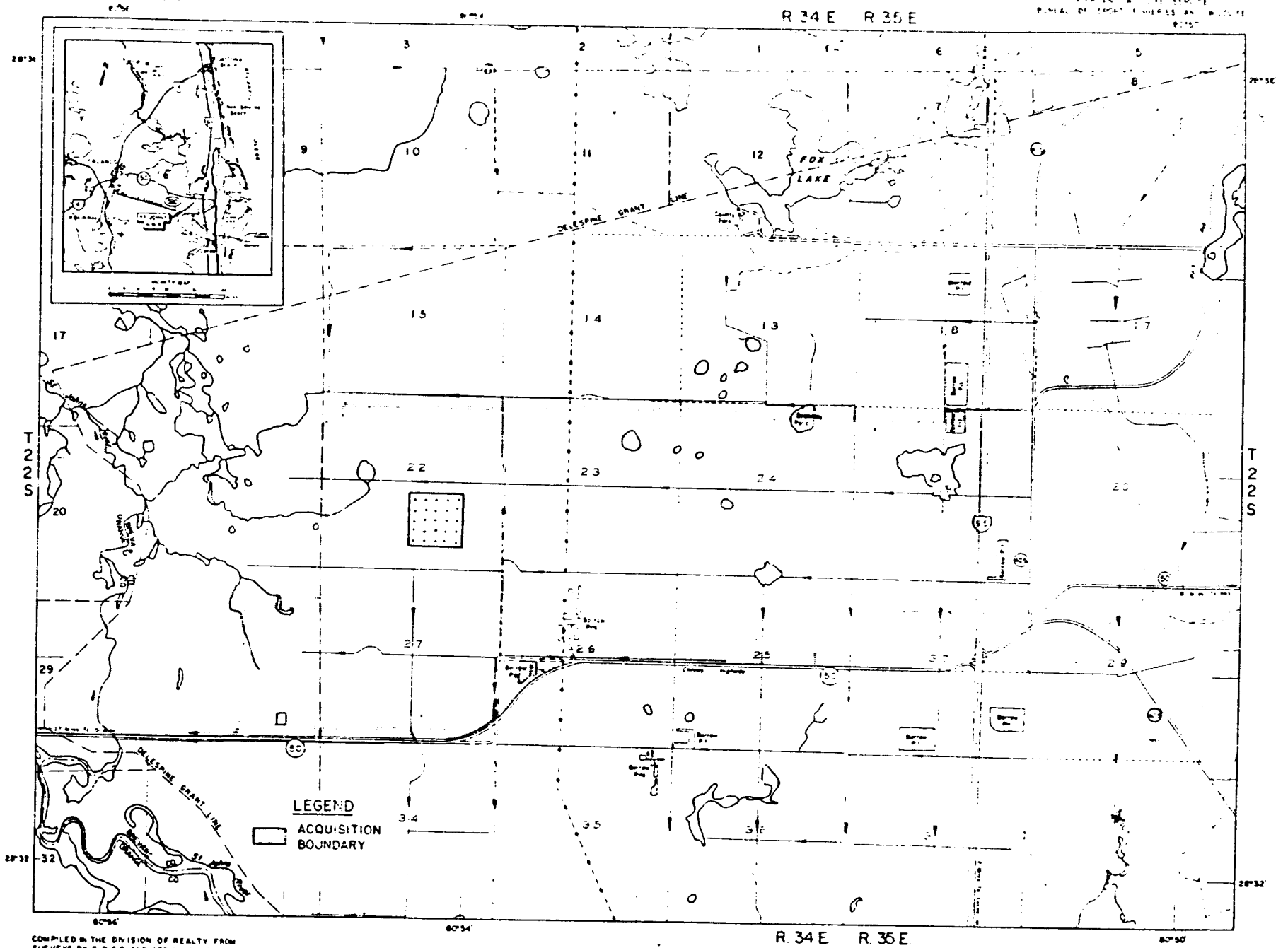
Refuge Approval: _____ Date: _____

Regional Approval: _____ Date: _____

Figure 1.

ST. JOHNS NATIONAL WILDLIFE REFUGE

BREVARD COUNTY, FLORIDA

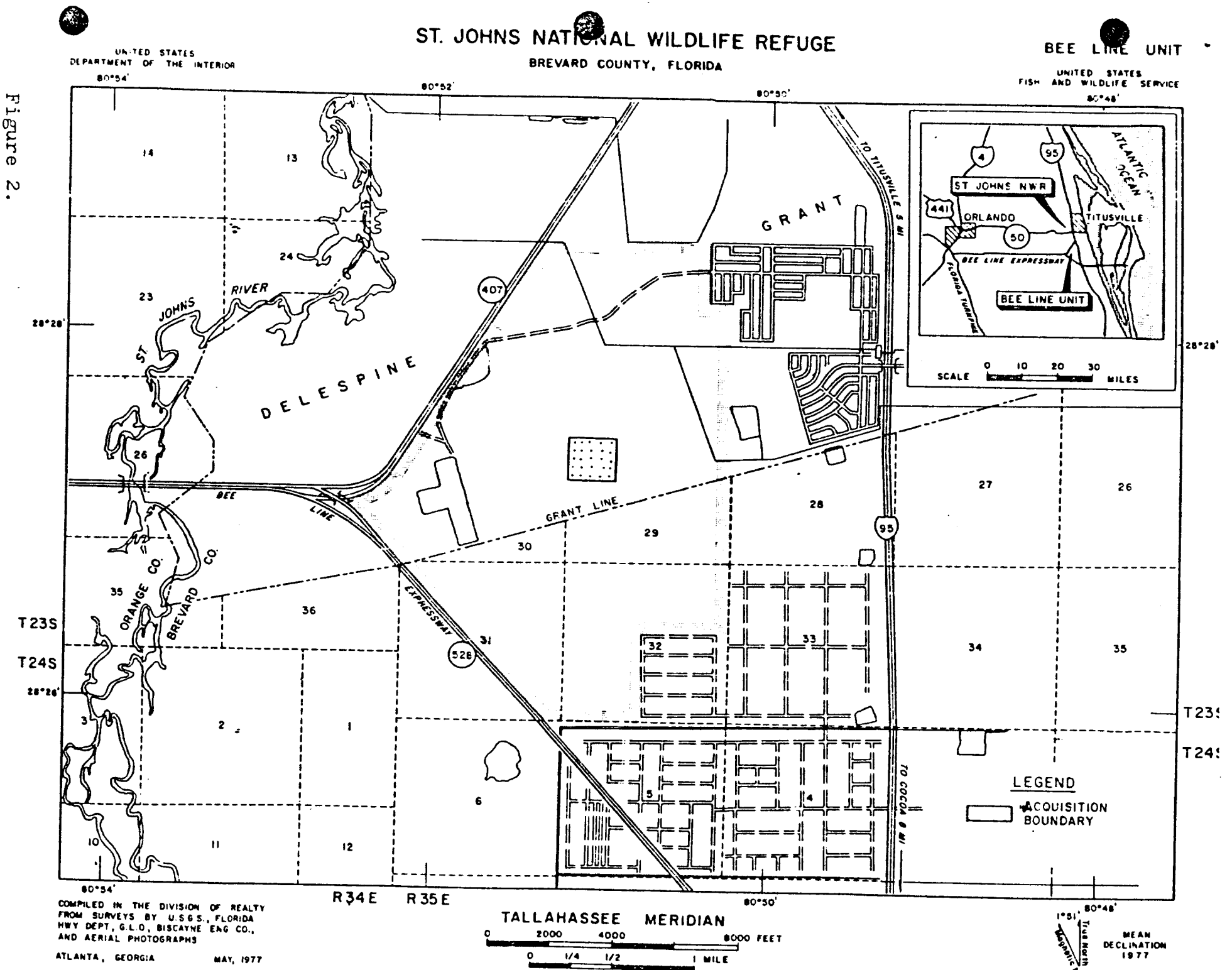


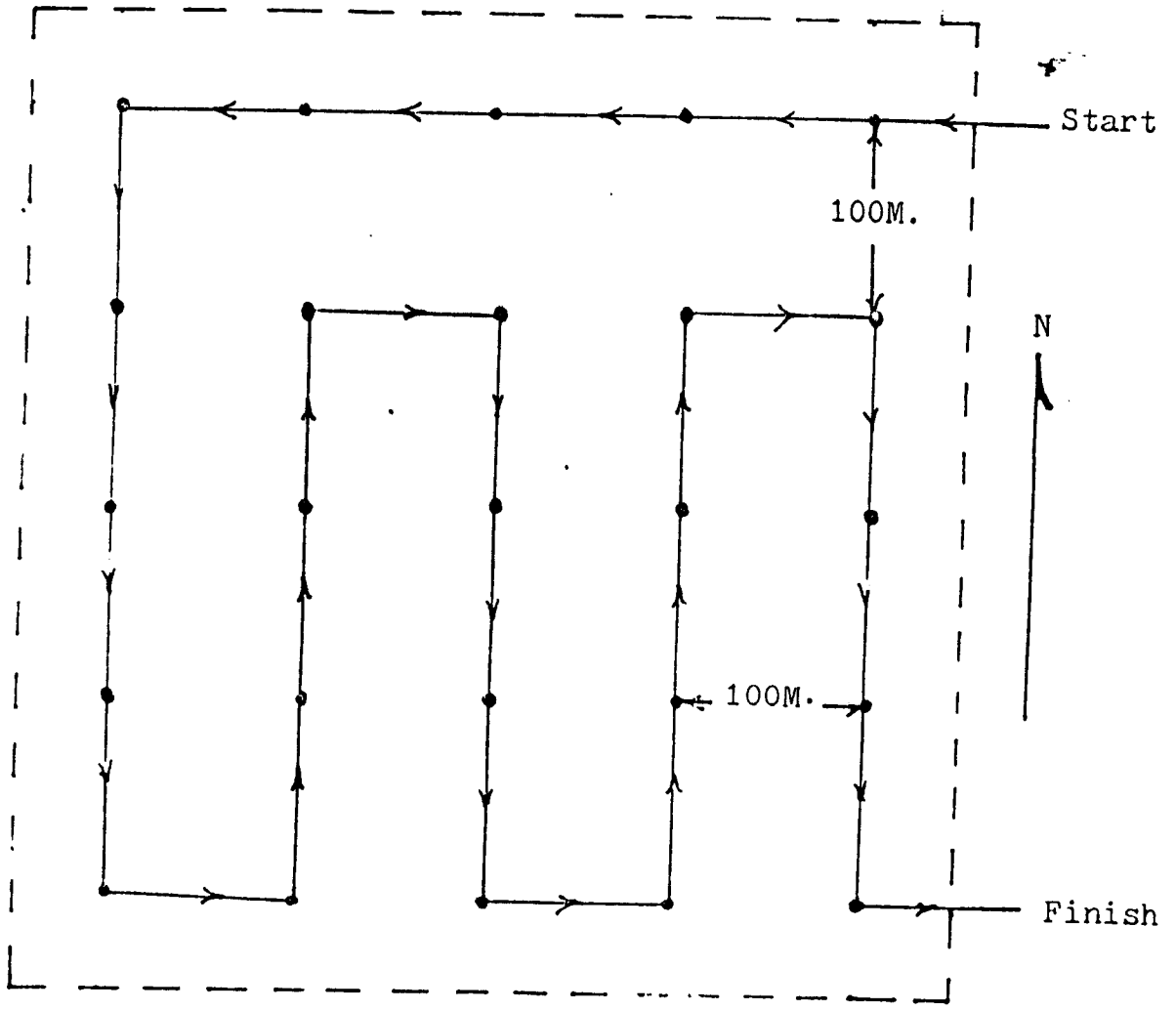
COMPILED IN THE DIVISION OF REALTY FROM SURVEYS BY C.B.G.S. AND AERIAL PHOTOGRAPHS

TALLAHASSEE MERIDIAN

ATLANTA, GEORGIA JULY, 1970

Figure 2.


ST. JOHNS NATIONAL WILDLIFE REFUGE
BREVARD COUNTY, FLORIDA
BEE LINE UNIT
UNITED STATES
DEPARTMENT OF THE INTERIOR
UNITED STATES
FISH AND WILDLIFE SERVICE
80°54'
80°52'
80°50'
80°48'
28°28'
28°26'
T23S
T24S
R34E
R35E
GRANT
DELESPINE
ST JOHNS RIVER
BEE LINE
GRANT LINE
EXPRESSWAY
TO TITUSVILLE 5 MI
TO COCOA 8 MI
ORANGE CO.
BREVARD CO.
407
528
95
ST JOHNS NWR
ORLANDO
TITUSVILLE
ATLANTIC OCEAN
441
50
4
BEE LINE EXPRESSWAY
FLORIDA TURNPIKE
BEE LINE UNIT
SCALE 0 10 20 30 MILES
LEGEND
ACQUISITION BOUNDARY
COMPILED IN THE DIVISION OF REALTY
FROM SURVEYS BY U.S.G.S., FLORIDA
HWY DEPT, G.L.O., BISCAYNE ENG CO.,
AND AERIAL PHOTOGRAPHS
ATLANTA, GEORGIA MAY, 1977
TALLAHASSEE MERIDIAN
0 2000 4000 8000 FEET
0 1/4 1/2 1 MILE
MEAN DECLINATION 1977



25 ha. Study Area

Figure 3. Study area and transect.

Transect name_____

Vegetation_____

Date_____Observer_____

Ground Moisture _____

Days since last rain _____

Time _____ _____

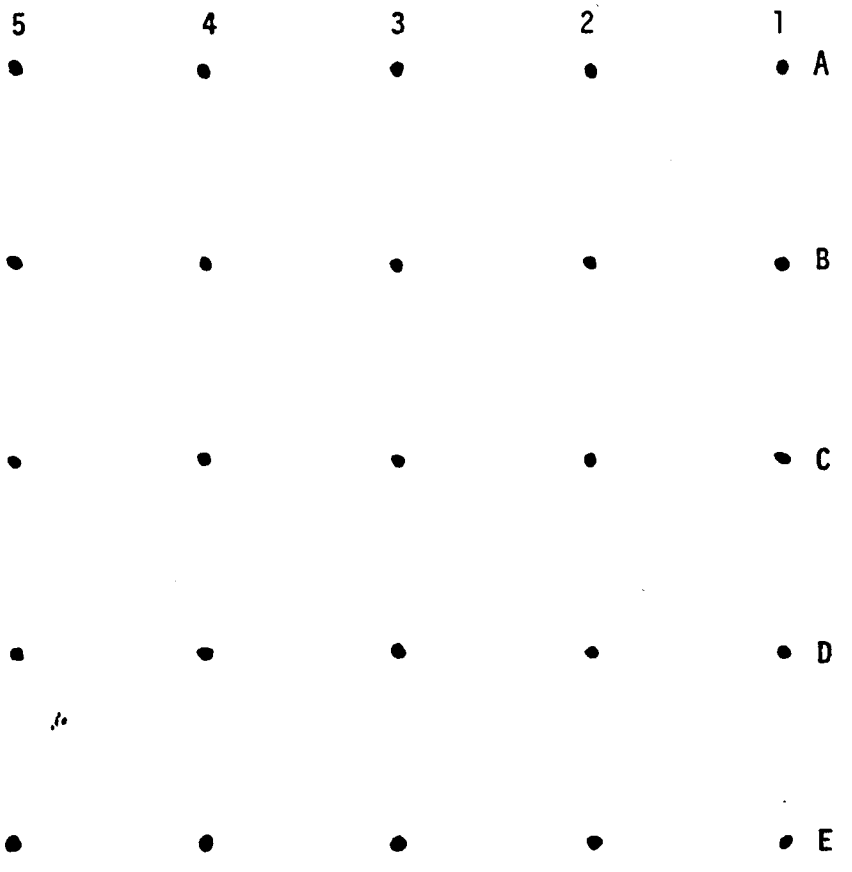
Wind _____ _____

Cloud Cover _____ _____

Cloud Type _____ _____

Temperature _____ _____

Winds _____ _____

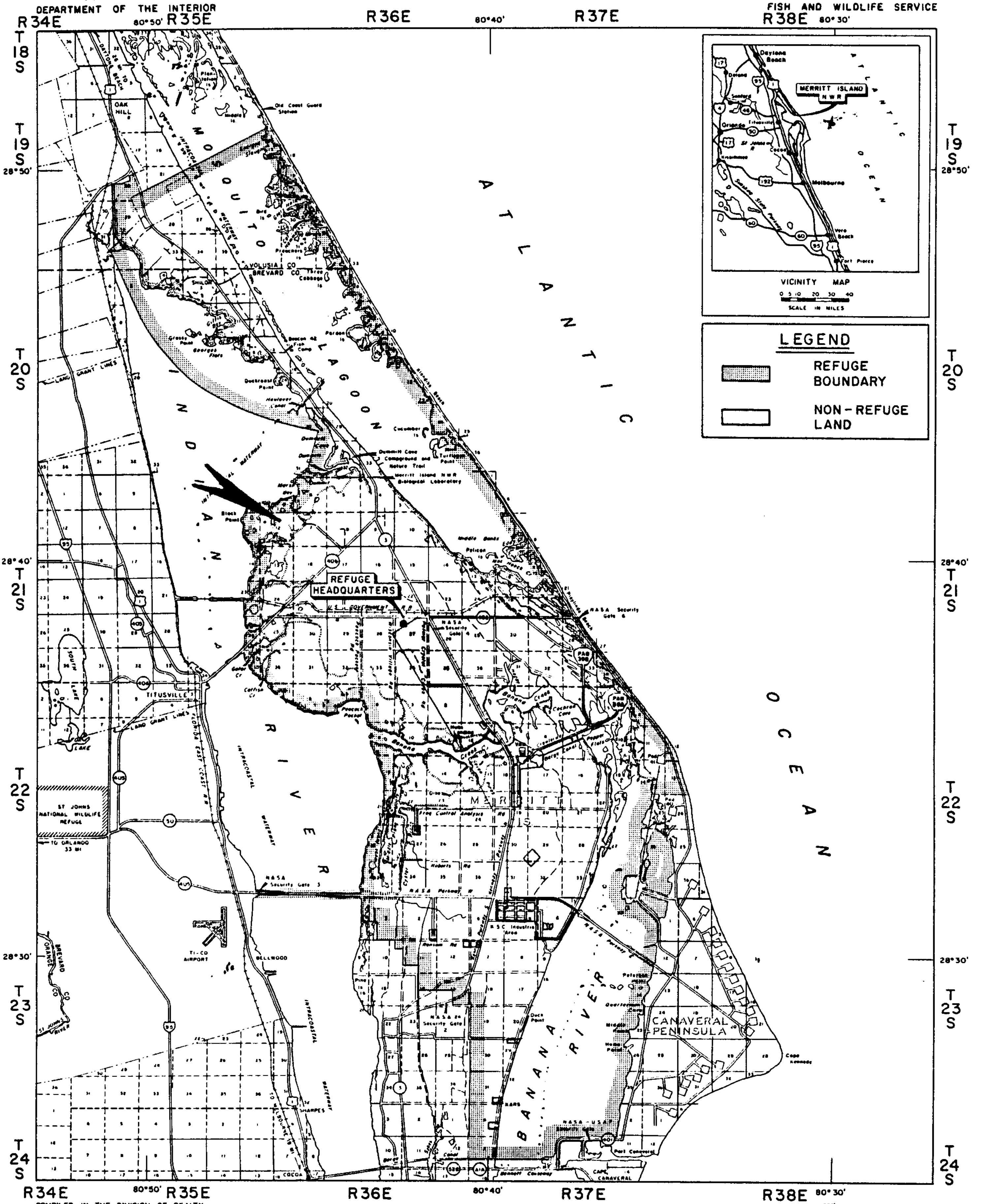


MERRITT ISLAND NATIONAL WILDLIFE REFUGE

BREVARD AND VOLUSIA COUNTIES, FLORIDA

UNITED STATES DEPARTMENT OF THE INTERIOR

UNITED STATES FISH AND WILDLIFE SERVICE



COMPILED IN THE DIVISION OF REALTY FROM SURVEYS BY U.S.G.S.

ATLANTA, GEORGIA

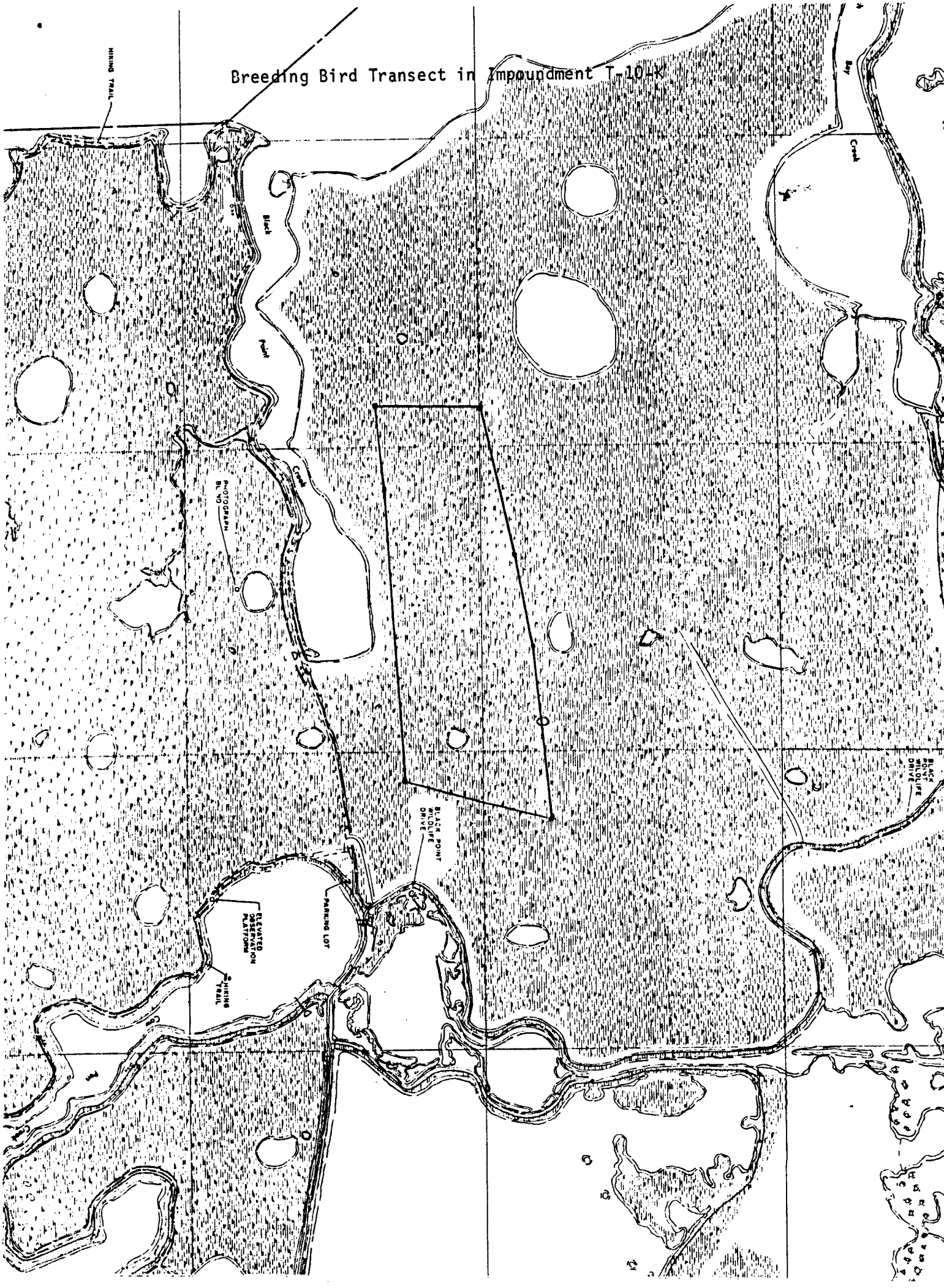
REVISED : 10/79
JANUARY, 1973

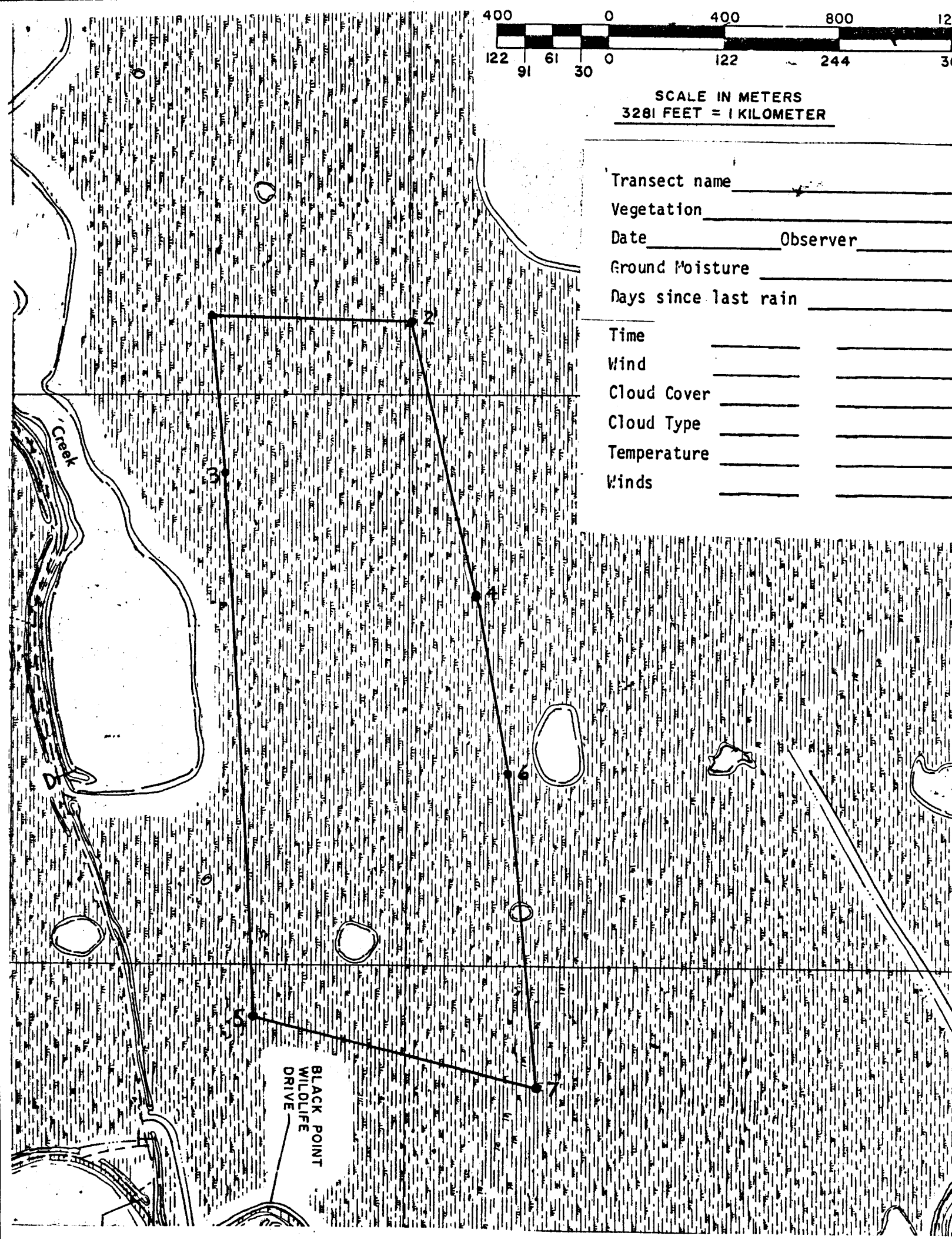
TALLAHASSEE MERIDIAN

Scale 0 5000 10000 20000 30000 40000 FEET
0 1/2 1 2 4 6 8 MILES

MEAN DECLINATION 1973

4R FLA 632 413


Breeding Bird Transect in Impoundment T-10-K
HIKING TRAIL
Black
Point
Creek
Bay
Creek
PHOTOGRAPH
BL 40
BLACK POINT WILDLIFE DRIVE
BLACK POINT WILDLIFE DRIVE
ELEVATED OBSERVATION PLATFORM
PARKING LOT
HIKING TRAIL


400 0 400 800
122 91 61 30 0 122 244
SCALE IN METERS
3281 FEET = 1 KILOMETER
Transect name
Vegetation
Date
Observer
Ground Moisture
Days since last rain
Time
Wind
Cloud Cover
Cloud Type
Temperature
Winds
Creek
BLACK POINT WILDLIFE DRIVE
1
2
3
4
5
6
7

Vegetation _____

Date _____ Observer _____

Page _____ of _____

Wind	_____	_____
Cloud Cover	_____	_____
Cloud Type	_____	_____
Temperature	_____	_____

	Bird number	Species	No. of Birds	Sex	Age	Behavior

Refuge: Merritt Island National Wildlife Refuge (MINWR)

Procedure: IP 702-9140-WR:701-9146-WT

Species: Loggerhead Sea Turtle (Caretta caretta) and Green Sea Turtle (Chelonia mydas)

Title: Marine Turtle Nest Production Survey

I. PURPOSE

The loggerhead and green sea turtle are listed as threatened and endangered species respectively by the USDI FWS. Both species nest on the beaches of the refuge, the loggerhead in large numbers and the green sea turtle in small but significant numbers. The purpose of this plan is to monitor nesting activity (numbers of nests and false crawls) and nest predation rates along the 6.2 miles (10 km) of refuge beaches as recommended in the FWS Region 4 Regional Resource Plan and Marine Turtle Recovery Plan. This information is also important in evaluating Wildlife Management Project MP 702-9140-WR:701-9146-WT, "Enhancement of Marine Turtle Nesting Success and Production as well as provide inventory and management data for these species.

II. PROCEDURE AND DATA ANALYSIS

A. Procedure

Each Monday between May 15 and September 15 the beach will be driven by a vehicle to mark all previous turtle crawls. Drive the vehicle across the turtle crawls as high upon the beach as possible without crossing nest sites. The next 3 consecutive days the beach will be driven again looking for new crawls from the night before (those not crossed by the tire tracks). Each crawl will be examined as to whether it is a false crawl or successful nest. False crawls usually have no body pit. Successful nests may be recognized by the crawl location on the beach in relation to an outgoing tide indicating a prolonged stay on the beach. Differentiate crawls and nests between loggerhead or green sea turtles (loggerhead - alternate tracks, green - opposite tracks). All false crawls and nests will be recorded. Record turtle species, date, distance from start point (location), and mark the nest with a numbered stake. Place the stake 1 meter north of the nest.

Check all previously marked nests for nest losses. Record type of nest loss - predation, erosion, poaching, etc. Erosion losses usually come after severe storms or tides. Predation is easily determined by signs of digging and shell fragments scattered about. Record date of predation and predating animal species if known for each predated nest. Record all nests that hatch. This will be evident by dozens of tiny tracks leading from the nest to the ocean.

One person familiar with all procedures is necessary for this survey. A 4x4 wheel drive vehicle with balloon tires or 3 wheel ATC is necessary to drive the beach and carry the equipment. The following materials are necessary or suggested for the survey: first aid kit, radio, tool box and tools, spare tire, data sheets, pencils, numbered stakes, insect spray, sunscreen. It is also suggested that the

inventory be conducted in the morning hours to avoid additional high tides from obscuring tracks and the hot afternoon temperatures.

Any strandings encountered during the survey should be recorded. Measure the carcass and record the data on standardized network forms and submit these to stranding coordinators. Mark or remove all stranded turtles so they cannot be counted again.

B. Data Analysis

Data will be summarized for both loggerhead and green sea turtles to determine: total number of nests (number nests counted X 2.5), total number of false crawls (number false crawls counted X 2.5), percent of nest success (number of successful nests / number of known fate nests), percent of nests lost (number of lost nests / number of known fate nests) by cause (predation, poaching, erosion), total number of nests lost (number of total nests X % of nests lost) by cause, number of eggs laid (total number of nests X 112 (loggerhead) or 135 (green), number of young produced (number of successful nests X 79 (loggerhead) or 117 (green)). (Ehrhart, L. M. 1980. Threatened and endangered species of the Kennedy Space Center: marine turtle studies. NASA Contract Rep. 163122. 105pp. + appendix. The data will be summarized throughout the nesting season in order to determine the effectiveness of Wildlife Management Plan MP 702-9140-WR:701-9146-WT in achieving established nesting success objectives.

C. Data Filing

Field and summary sheets will be filed in the refuge files under: WILDLIFE: Marine Turtle Nest Production Surevy. Each year's data will be kept separately.

III. SPECIAL CONSIDERATIONS

The Marine Turtle Recovery Plan has established "... goal of beach management is to maximize reproductive potential of threatened or endangered marine turtles, in a cost-effective manner." Management strategies applicable to MINWR include ground monitoring nesting beaches on a regular basis at intervals sufficient to estimate total nests for the entire season and determining productivity by marking nests and calculating success for the entire beach.

The 3 times per week represents a 43% sampling rate. Statistical analysis of past data indicates that a sampling rate less than this is not sufficient to explain annual population variance.

VI. MANPOWER AND COSTS

These costs represent an independent survey. Costs for this survey can be significantly reduced by combining it with other beach activities occurring at the same time (e.g. raccoon removal and shorebird survey).

Personnel (264 staff-hours)	$ 3250.00
Transportation	
Vehicle operations and maintenance	1500.00
Other expenses	
Consumable supplies, stakes, paint, etc.	200.00
TOTAL	$ 4950.00

Prepared by: Bill Leenhouts Date: 06-04-85

Reviewed by: _____ Date: _____

Refuge Approval _____ Date: _____

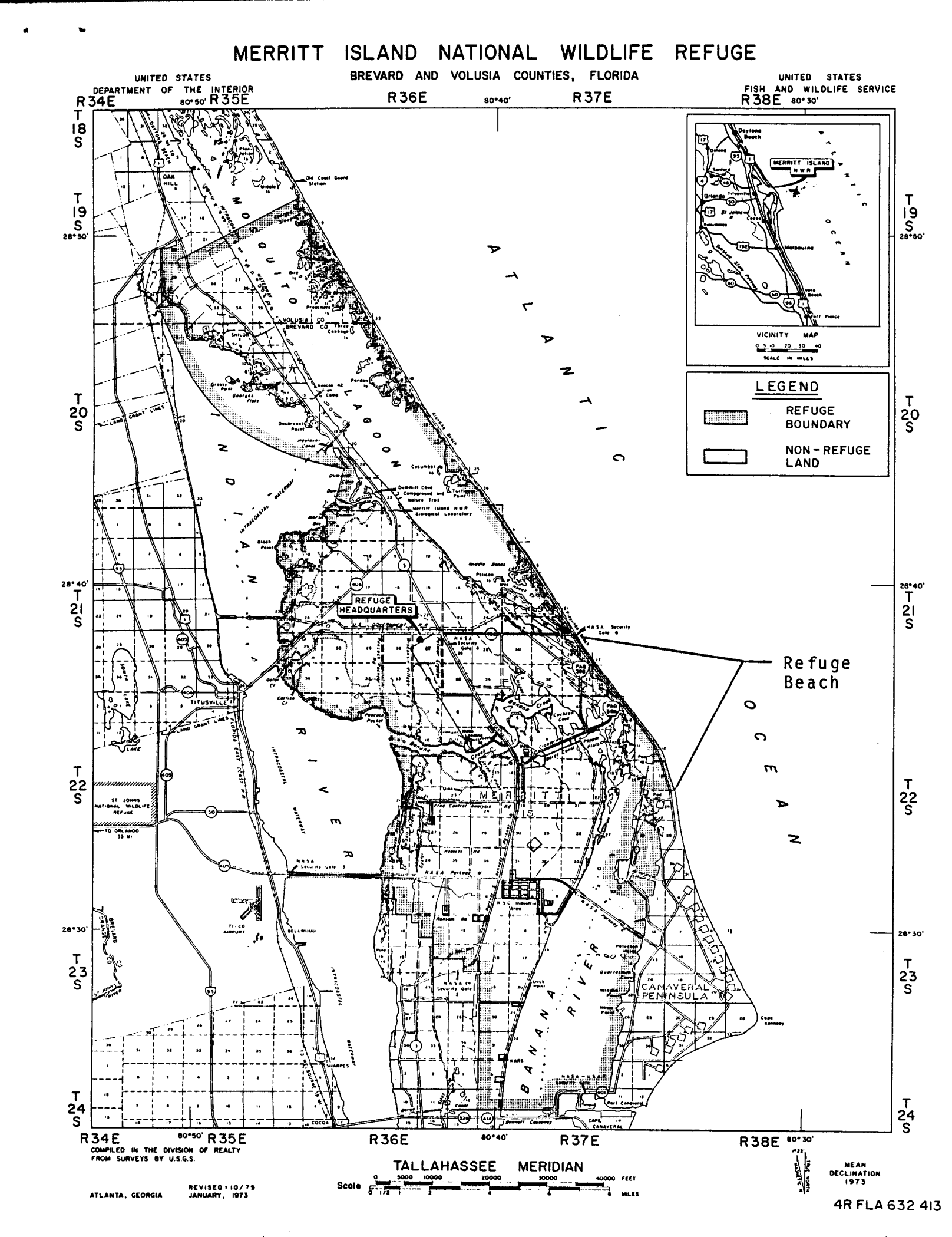
Regional Approval _____ Date: _____

MERRITT ISLAND NATIONAL WILDLIFE REFUGE

BREVARD AND VOLUSIA COUNTIES, FLORIDA

UNITED STATES
DEPARTMENT OF THE INTERIOR

UNITED STATES
FISH AND WILDLIFE SERVICE



LEGEND

- REFUGE BOUNDARY
- NON-REFUGE LAND

COMPILED IN THE DIVISION OF REALTY
FROM SURVEYS BY U.S.G.S.

ATLANTA, GEORGIA

REVISED · 10/79
JANUARY, 1973

TALLAHASSEE MERIDIAN

Scale 0 5000 10000 20000 50000 40000 FEET
0 1/2 1 2 4 6 8 MILES

MEAN DECLINATION 1973

4R FLA 632 413

MARINE TURTLE SURVEY DATA

Date	Location	Nest No.	CHECK APPROPRIATE BOX				NEST DATA		
			Crawl	Nest	Loggerhead	Green	New	Predated	Hatched

Refuge: Merritt Island National Wildlife Refuge (MINWR)

Procedure: IP 702 9001 WR

Species: American Alligator (Alligator mississippiensis)

Title: Alligator Survey

I. PURPOSE:

This survey was begun in 1971 to establish a baseline from which annual changes and long term trends in the population status of the American alligator could be detected and not an estimate of the total population of the refuge. This survey is coordinated with the Alligator Sub-committee of the Southeastern Section of The Wildlife Society. The results will be used by the refuge to track the population dynamics of alligators on the *refuge and* also to determine the population dynamics of alligator populations throughout the Southeast.

II. PROCEDURE AND DATA ANALYSIS

A. Procedure

The count should be made during the dark of the moon and should begin about one hour after sunset. Alligators can be classified while traveling along at a fairly rapid pace. However, the observer should adjust the speed to make certain that animals are not over-looked. The number of alligators seen should be tabulated by one-foot size classes. The distance from the nose to the eye in inches provides a reliable estimate of the total length in feet. One count of the survey line is to be scheduled each year during the third week in August. The count should be made when the temperature is above 70 degrees. Equipment needed in the survey include: Airboat, Q-beam light, pickup truck, recorder, office supplies, etc. Two people are needed for each survey route.

Five survey routes have been established on the refuge and have been used since 1979:

Route 1: 3.4 miles - to be run by a boat in the canal that parallels the dike on the western edge of the Shiloh 5 impoundment. The starting point is the spillway 1.1 miles south of the junction of the Shiloh dike road and U. S. 1 and ends at the indian mound in the impoundment. The boat will stay in the canal and the observer will count alligators ahead and to the east. This is a dead end route and alligators will be counted on the first pass only. A two person team is required - boat operator and observer. The observer will use a tape recorder to record all data.

Route 2: 2.0 miles - to be driven by pickup truck along Max Hoeck Wildlife Drive. The starting point is the first visible water on the north side of the road going west from Playalinda beach and ends at the intersection of the west Mosquito Lagoon dike road. All visible open water on both sides of the road will be surveyed. A three person team is needed - driver and 2 observers. Each observer will use a tape recorder to record all data.

Route 3: 2.5 miles - to be run by boat in the T-15-E canal that parallels the dike on the eastern edge of the southern half of Moore Creek. The route starts at the Moore Creek pump station at the end of Frequency Control Analysis Road and ends at the culvert in the canal that parallels Roberts Road. The boat will stay in the canal and the observer will count alligators ahead and to the east. This is also a dead end route and alligators will be counted on the first pass only. A two person team will be needed - observer and boat operator. The observer will use a tape recorder to record all data.

Route 4: 3.4 miles - to be driven by a pickup truck along Frequency Control Analysis Road. The starting point is the first visible water past the first culvert in the canal paralleling Frequency Control Analysis Road and ends at the pond at the end of the road. All visible water on both sides of the road will be surveyed. A 3 person team is needed - driver and 2 observers. The observers will record all data on tape recorders.

Route 5: 2.8 miles - to be driven by a pickup truck along NASA Parkway from the junction with Kennedy Parkway west to the end of the ditch. Both sides of the road will be surveyed, but each will be done separately. A 2 person team is needed - driver and observer. The observer will record all data on a tape recorder.

B. Data Analysis

Survey data will be taken from the tape recorder and recorded on AS-TWS survey forms and submitted to them following each annual survey. A summarization of the data to include size classes and animals seen per mile will be made.

C. Data Filing

Copies of the AS-TWS data sheets and annual summary will be filed in the refuge files under WILDLIFE: Alligator Survey.

III. SPECIAL CONSIDERATIONS

This survey is a Federal - state cooperative survey designed to provide alligator population dynamics to both the refuge and states within the Southeast region.

IV. MANPOWER AND COSTS

Personnel (40 staff-hours)	500.00
Transportation	100.00
Other Equipment (batteries, tapes, etc,)	75.00
TOTAL	$ 675.00

Prepared By: Bill Leenhouts Date: 03-26-84

Reviewed By: _____ Date: _____

Refuge Approval: _____ Date: _____

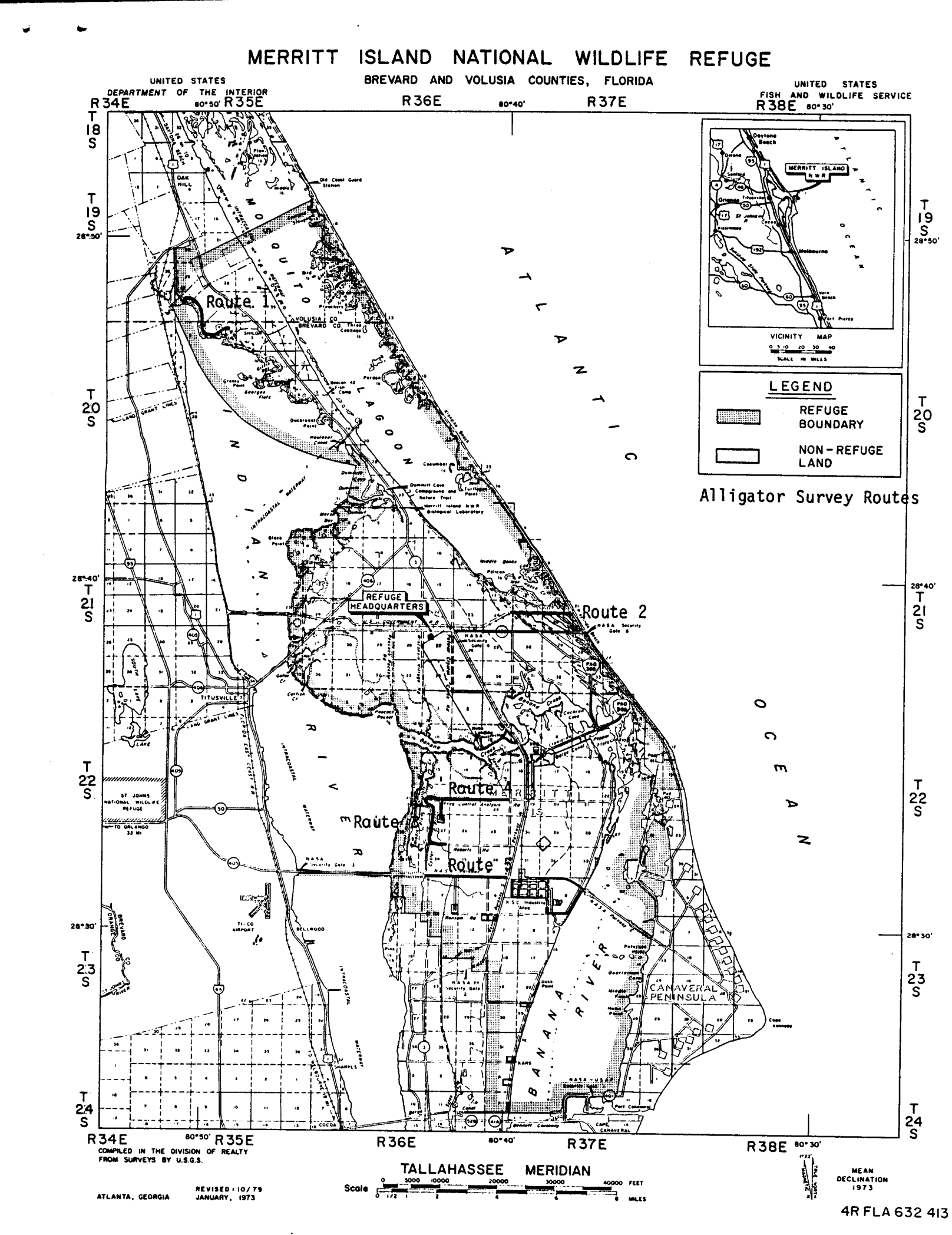
Regional Approval: _____ Date: _____

MERRITT ISLAND NATIONAL WILDLIFE REFUGE

BREVARD AND VOLUSIA COUNTIES, FLORIDA

UNITED STATES
DEPARTMENT OF THE INTERIOR

UNITED STATES
FISH AND WILDLIFE SERVICE



COMPILED IN THE DIVISION OF REALTY
FROM SURVEYS BY U.S.G.S.

ATLANTA, GEORGIA

REVISED · 10/79
JANUARY, 1973

TALLAHASSEE MERIDIAN

Scale 0 5000 10000 20000 30000 40000 FEET
0 1/2 1 2 4 6 8 MILES

MEAN DECLINATION 1973

4R FLA 632 413

ALLIGATOR SURVEY FORM
TALLY SHEET

observation According to Size Classes
(Length in Feet)

Total Length (feet)	Number of Alligators Seen			
	Date Line No.	Date Line No.	Date Line No.	Date Line No.
Less Than 1				
1 - 2				
2 - 3				
3 - 4				
4 - 5				
5 - 6				
*Unknown<6				
6 - 7				
7 - 8				
8 - 9				
9 - 10				
10 & over				
*Unknown>6				
Total				
**Percent of line on a refuge				
Total distance surveyed (miles)				

State:_____ County (Parish):_____

Observer/s:_____

Provide a description of each line:_____

*Observed but could not approach to identify size. Classify as less or greater than 6'.

**Indicate the percentage of the survey line that lies within a wildlife refuge, park, management area, or other area providing special protection.